CEREAL SCIENCE today

35c PER COPY

MAY 1960 VOLUME 5 • NUMBER 5

UNIVERSITY OF BRITISH COLUMBIA
MAY 2- 1960
THE LIBRARY

AN OFFICIAL PUBLICATION
OF THE
AMERICAN ASSOCIATION
OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

PICTURE HIGHLIGHTS OF AACC MEETING

MOISTURE MEASUREMENT IN GRAIN INDUSTRY

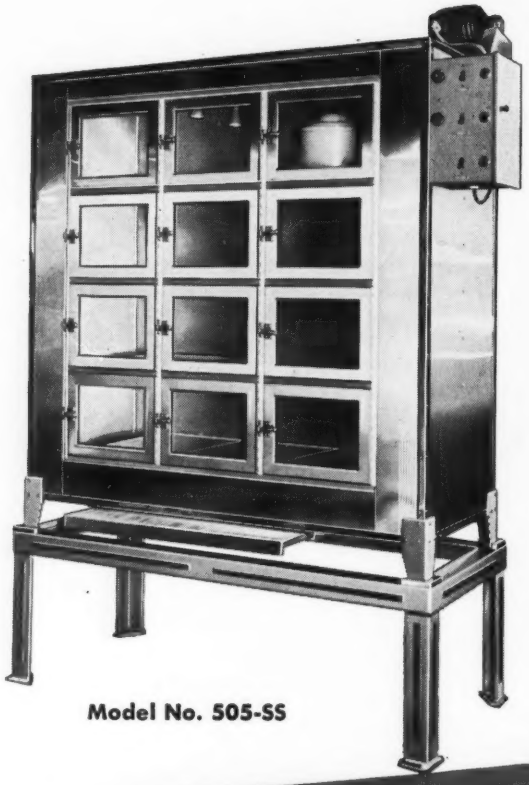
LEAVENING ACIDS

The BAILEY No. 505-SS

Fermentation Cabinet

This stainless cabinet is the successor to the [illegible] Model No. 505 which has been on the market for some years. Many units of the re-designed model have been put into service in leading laboratories with very good success.

- Walton Humidifier with constant level control
- Stainless Exterior
- Stainless Interior
- Stainless or brass hardware
- Built-in Sliding Shelf
- 110-120V 60C A.C. Current. Maximum load 1600 watts
- ¼ ton Refrigeration Unit Extra — $380.00
- Outside Cabinet Dimensions 60" x 60" x 24" deep
- Welded steel stand is 24" high or will build to suit. Grey shrivel finish — stainless trim Extra — $108.00

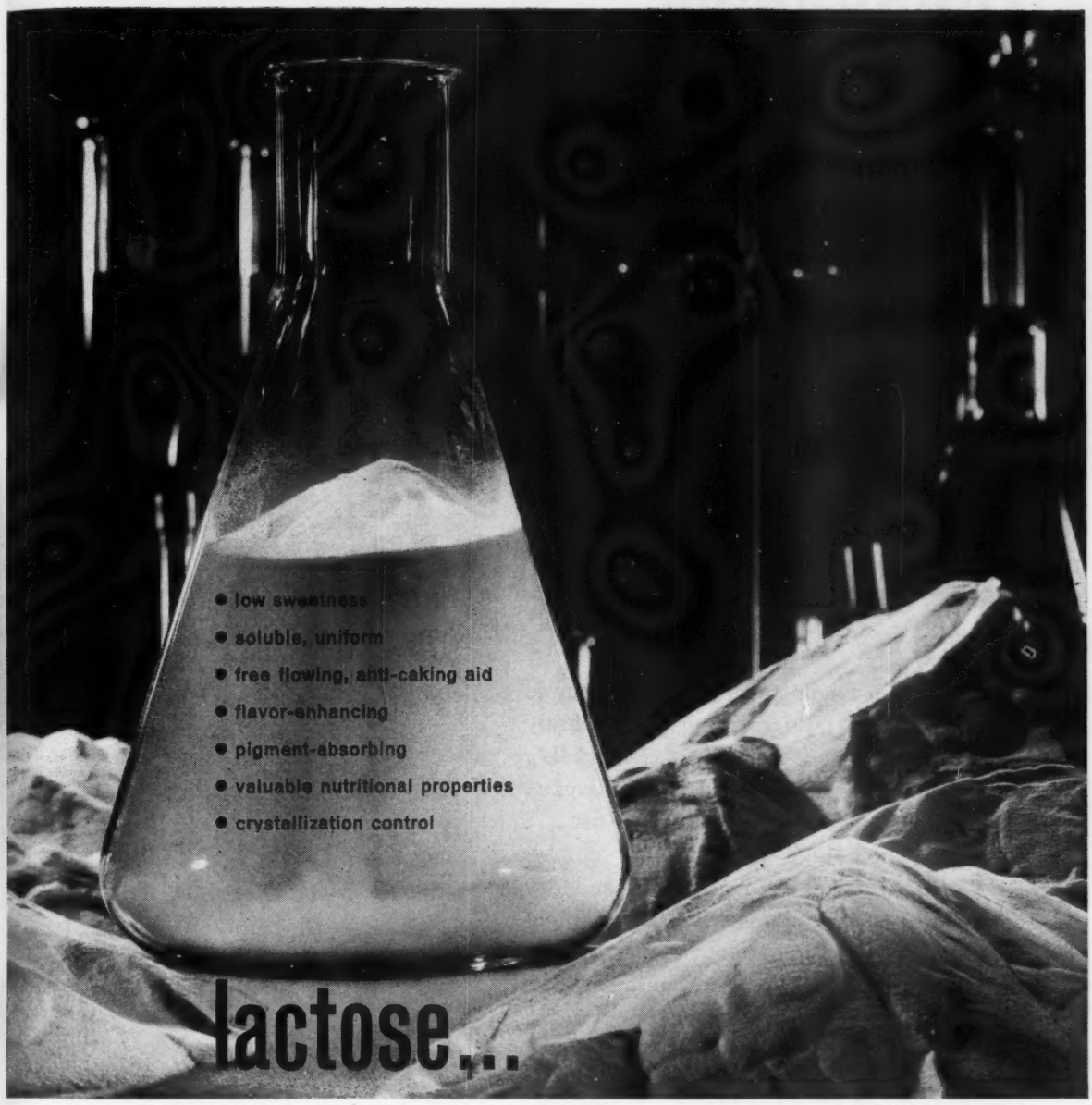


Model No. 505-SS

Model No. 505-SS Bailey Fermentation Cabinet — $1658.00
Est. Shipping Weight 1000 lbs.
Prices F.O.B. Lincoln, Nebr.

CERTIFIED CHEMICAL EQUIPMENT MANUFACTURER

NATIONAL MFG. COMPANY
LINCOLN, NEBRASKA



MOST-VERSATILE SUGAR KNOWN

Lactose is an amazing sugar with unlimited uses. It can improve your present products and help you develop new ones. It can lower your costs, simplify your processing. New uses are being discovered for it every day.

Only Western can supply Lactose (edible) in the full range of particle sizes required for various food applications. Strict chemical and bacteriological specifications and a rigid quality control program assure highest quality.

Take a fresh look at the characteristics of Lactose. One of them may help solve the problem you are working on right now. For free samples and information, write our Technical Service, Department 50E. (Tell us the applications you are considering.)

Foremost lactose

WESTERN CONDENSING COMPANY

Appleton, Wisconsin

World's Largest Producer of Lactose-Pure Milk Sugar

Distributed Nationally by Chemical Department, McKESSON & ROBBINS, INC.

ANNOUNCING...

EVERISE*

NEW "STICKY WEATHER" LEAVENING DISCOVERY

NOW... a leavening agent that ends humid weather's threat: "*tired flour*" that barely rises to the occasion. *EVERISE*, remarkably stable new sodium acid phosphate leavening agent, simply will not hydrate before use . . . no matter how high the humidity climbs. *EVERISE* in your self-rising flour and dry mixes will *guarantee* housewives fluffy, high-volume bake goods all summer long . . . even with that last cup from the container (the cup that makes or loses a repeat sale).

EVERISE blends easily . . . is exceptionally free-flowing, yet very low-dusting (dust number: 35). Just fine for automatic feeding. Get all the facts on *EVERISE*. Mail the coupon, today.

**Monsanto Trademark (Reg. Pending). Packaged in bags antislip-treated with Syton®P for easier handling and stacking.*

Monsanto®

We look forward to seeing you at the 64th Annual Technical Conference of the Assn. of Operative Millers . . . May 23-26, at the Sheraton-Jefferson Hotel in St. Louis.

MONSANTO CHEMICAL COMPANY,
Inorganic Chemicals Division,
St. Louis 66, Mo.

I would like: ☐ more facts on Everise; ☐ sample for testing; ☐ technical assistance in formulating.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

VOLUME 5 • NUMBER 5 • MAY 1960

CEREAL SCIENCE today

FEATURES

Presidential Address. Where Do We Go From Here? D. B. Pratt, Jr. 128
Moisture Measurement in the Grain Industry. Lawrence Zeleny 130
45th Annual Meeting, AACC 138
Leavening Acids: Their Effect on the Shelf Life of Cake Mixes and on Cake Grain. J. F. Conn and T. P. Kichline 143

DEPARTMENTS

Editorial 127
People, Products, Patter 148
AACC Local Sections 152
President's Corner 156
International Reports 156
Feed Technology 157
Previews from CEREAL CHEMISTRY 157
Book Reviews 158
"30" 160

STAFF

PAUL E. RAMSTAD, EDITOR

R. J. TARLETON, Managing Editor
C. H. BAILEY, Consulting Editor
EUNICE R. BROWN, Assistant Editor
DOREEN RENTZ, Circulation Manager

DEPARTMENT EDITORS
Baking Technology:
Oscar Skovholt,
Cecil F. Pinney
Feed Technology:
Robert C. Wornick
Flour Milling:
H. H. Schopmeyer
Laboratory Helps & Gadgets
Donald C. Meek
Nutrition:
W. B. Bradley
Sanitation:
Kenton L. Harris
Starch and Starch Products:
Frank E. Horan, Thos. J. Schoch
Washington Highlights:
Frank L. Gunderson

CORRESPONDING EDITORS
AUSTRALIA: R. A. Bottomley
CANADA: T. R. Aitken
DENMARK: Holger Jorgensen
ENGLAND: J. B. M. Coppock, C. R. Jones
FRANCE: Jean Buré
GERMANY: Paul Pelshenke
HOLLAND: G. L. Bertram
ITALY: Ottavio Chiriotti
JAPAN: Mitsuo Uemura
NORWAY: Halvor Norheim
PERU: Miguel Rasic
SPAIN: A. Quintana Mari
SWEDEN: Sven Hagberg

COVER: John A. Johnson, Kansas State University, Manhattan, New President, American Association of Cereal Chemists

Copyright © 1960 by the American Association of Cereal Chemists, Inc.

CEREAL SCIENCE Today is published ten times per year (monthly except June and August) by the American Association of Cereal Chemists, from 500 South 5th Street, Minneapolis 15, Minnesota. Editorial, Circulation and Advertising Headquarters: 1955 University Avenue, St. Paul 4, Minnesota. Entered as second class matter at the post office at Minneapolis, Minn., under the Act of August 24, 1912.

The American Association of Cereal Chemists assumes no responsibility for the statements and opinions advanced by contributors to its publications. Views expressed in the editorials are those of the editors and do not necessarily represent the official position of the American Association of Cereal Chemists.

Subscription rates: 1 year, $3.00; 2 years, $5.00; 3 years, $7.00. Foreign postage: $1.00 per year extra. Back issues available on request. Single copies: 35 cents.

CHANGE OF ADDRESS: Notify Circulation Department, American Association of Cereal Chemists, 1955 University Avenue, St. Paul 4, Minn. Include both old and new addresses and postal zone number, if any. Claims for missing numbers will not be allowed if received more than 60 days from date of mailing plus time normally required for postal delivery of journal and claim. No claims allowed when subscriber has failed to notify the Circulation Department of a change of address, or because copy is "missing from files."

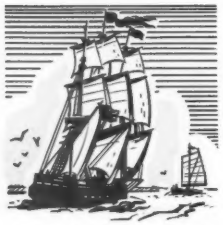
The Vital Story of VITAMIN B_1

by Science Writer

(Thiamine)

Sailors, Chickens and Rice. Japanese sailors on Pacific cruises, chickens in an East Indian prison hospital yard, a Polish scientist working in London, a British biochemist at Cambridge, American doctors in the Philippines, chemists in the U. S. A. are all part of the world-circling vitamin B_1 picture.

Beriberi, the serious — sometimes fatal — disease with the pleasantly rhythmic name, is intimately connected with B_1. Research into the cause of beriberi helped in the discovery of B_1. Knowledge of the vitamin and its value to health also came from scientific studies of normal nutrition.



In the 1880's Takaki, a medical officer of the Japanese Navy, worked on the problem of beriberi which affected up to 40% of the sailors annually and was fatal to many. By supplementing the crew's rice with barley, meat, vegetables and condensed milk, he succeeded in practically eliminating the disease from the Japanese Navy in a few years. Of the fourteen cases of beriberi that occurred during this experiment, each had neglected to eat his daily allowance of the new foods.

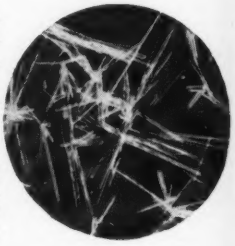
Fowl Experiments. Elsewhere in the Orient, a Dutch physician, Christiaan Eijkman, made two far-reaching observations: that chickens which lived in the bare yard of a prison hospital in the Netherlands East Indies had symptoms similar to those of his beriberi patients, and that these fowl fed on scraps of white rice from the prison table. Intrigued, he conducted feeding experiments with fowl, and caused the disease in them by a diet of polished white rice. Eijkman was honored with the Nobel Prize for his work.

Other demonstrations also showed that beriberi was caused by a deficiency in the diet. These findings led to investigations of the mysterious substance, present in some foods but absent in white rice, which prevented occurrence of the disease.

In 1912, two scientists working in Great Britain published significant reports. Hopkins, founder of the School of Biochemistry at Cambridge, discovered and reported that minute amounts of some unidentified substance were needed in the diet to promote growth and maintain health. The Polish scientist, Funk, then working in London, reviewed existing knowledge about beriberi, scurvy, rickets and pellagra. He suggested the theory that these diseases were caused by a lack of *vitamine*, a word he coined to describe the missing substance. Using extracts of rice bran, he tried to isolate the unknown element, which he knew acted against beriberi.

Rice Yields Its Secret. The deficiency theory was proved correct, but many years were to pass before the pure vitamin was isolated. Credit for this goes to two Dutch chemists, Jansen and Donath, who succeeded in preparing crystals of vitamin B_1 (thiamine hydrochloride) in 1926 from extract of rice polishings. Their success was confirmed by other investigators: Windaus in Germany, Peters in England, Ohdake in Japan and Van Veen in Java.

The Vitamin Described. With a faint, pleasant odor somewhat like yeast, and a nut-like and salty taste, thiamine hydrochloride is a white powder, easily soluble in water and slightly in alcohol. It is insoluble in animal or vegetable fats, although traces of the vitamin may be present in foods which are composed principally of fat.



In chemistry, the vitamin has this formula: $C_{12}H_{17}ON_4SCl \cdot HCl$. This means it is composed of carbon, hydrogen, oxygen, nitrogen, sulfur, and chlorine. Another form of vitamin B_1 is thiamine mononitrate, which has the empirical formula $C_{12}H_{17}N_5O_4S$ and is made of carbon, hydrogen, nitrogen, oxygen, and sulfur. The picture at right shows crystals of vitamin B_1 as seen through the microscope.

Names and Measures. Vitamin B_1 has been called by a variety of synonyms. Those surviving are *thiamine* (sometimes *thiamin*) in the U. S. A. and *aneurin* in Europe. When not otherwise specified, the name vitamin B_1 (or thiamine) ordinarily refers to the chloride hydrochloride salt. Recently another salt, the mononitrate, has also found commercial use.

The vitamin is customarily measured in milligrams, which truly are tiny quantities: one ounce contains 28,349.5 milligrams.

Men Make it. Man-made vitamin B_1 is so plentiful today that the years of study and work which led to the vitamin's successful synthesis may not be remembered.

For example, consider R. R. Williams, whose name is intimately associated with the vitamin. He began his work in Manila in 1910 when he was first interested in completely analyzing rice bran extract. A quarter-century of work followed, resulting in the synthesis or thiamine by himself and his co-worker, J. K. Cline. During these years, the vitamin had been isolated from natural sources, and its chemical composition learned. The next step was laboratory synthesis, which, as with many scientific events, was made by several groups at almost the same time. The Williams-Cline synthesis was announced in 1936. That same year Andersag and Westphal, and in 1937 Bergel and Todd, reported their syntheses. Still later (1952) Matsukawa and Iwatsu reported another synthesis.

Commercial Production. Before a man-made vitamin can be abundantly supplied, the laboratory procedures must be translated to commercial production methods. This was done for vitamin B_1 — with many important developments in technique made by the world-famous firm of Hoffmann-La Roche.

Long a leader in vitamin research and manufacture, Roche today produces pure, low-cost vitamin B_1 in huge quantities — "by the tons" — for use in pharmaceutical preparations, and in the enrichment, fortification and restoration of processed grains.

This man-made vitamin is identical chemically and biologically with the vitamin obtained from natural sources.

How Vitamin B_1 Works. Thiamine works within the living cells as an essential part of carbohydrate metabolism. As the body converts foods to energy through chemical means, it uses enzymes, which are necessary to the process. Vitamin B_1 is converted to its pyrophosphate, cocarboxylase, and acts as part of one of these enzymes. If too little of the vitamin is present, not all of the carbohydrate is used, and pyruvic acid builds up in the tissues and body fluids.

In human beings, vitamin B_1 is absorbed into the system through the small intestine. It is one of the vitamins which is needed daily, as the body does not store it in quantity. Only enough for a few days' needs is present at any time. Strangely, the body takes in only the amount of thiamine required for the time being. Any excess is excreted or destroyed.

How Much Do We Need? The Food and Nutrition Board of the National Academy of Sciences—National Research Council is universally regarded as an authority on our needs of essentials in the diet. It recommends that, daily, we have the amounts of vitamin B_1 given in the table below to maintain good health.

Daily Vitamin B_1 Needs in Milligrams

Men, age 25	1.6	Infants, 7 mos.-1 year	0.5
Men, age 45	1.5	Children, age 1-3	0.7
Men, age 65	1.3	Children, age 4-6	0.9
Women, age 25	1.2	Children, age 7-9	1.1
Women, age 45	1.1	Children, age 10-12	1.3
Women, age 65	1.0	Boys, age 13-15	1.6
Women, pregnant (2nd half)	1.3	Boys, age 16-19	1.8
Women, lactating	1.7	Girls, age 13-15	1.3
Infants, 2 mos.-6 mos.	0.4	Girls, age 16-19	1.2

Minimums Not Enough. A discussion of the Food and Nutrition Board's findings is contained in publication #589 of the National Academy of Sciences in Washington, D. C.

The Food and Drug Administration of the U. S. Department of Health, Education and Welfare has set *minimum* limits for vitamin B_1 in the daily diet. These are the figures used by most manufacturers as the basis for label statements that the stated quantity of the product provides a specified percentage of the minimum daily requirement of vitamin B_1. In comparing label statements of products, therefore, remember that a lower percentage in terms of the National Research Council's daily allowances for adequate nutrition may be the same or possibly higher than a percentage of the Food and Drug Administration's "minimum daily requirement."

Minimum Daily Requirement in Milligrams

Adults	1.0
Children, age 6-11	0.75
Children, age 1-5	0.5
Infants	0.25

How Physicians Use Thiamine. A serious prolonged deficiency of vitamin B_1 leads inevitably to beriberi, medically known as *multiple peripheral neuritis*. Symptoms appear in the nervous system, changes occur in the heart, and there is usually muscle swelling from excess fluid in the tissues. The disease can be fatal.

Partial deficiency may cause fatigue, loss of appetite, headache, irritability, poor sleep, and disorders of the digestive system. Physicians administer pure vitamin B_1, often in substantial amounts and with other vitamins, to correct the situation. They may also advise changes in the diet and supplementary vitamin intake to prevent recurrence.

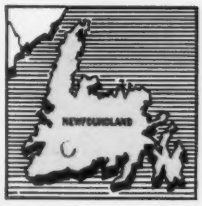
Beriberi Victim

Everyone Won This Battle. The value of thiamine in helping to combat beriberi was dramatically proven on the Bataan peninsula in the Philippines. In Asian countries dependent mainly on polished white rice for food this sometimes fatal disease can be a problem. This is particularly true for infants who do not receive enough of the vitamin from their nursing mothers.

An attack, sponsored by the Government of the Philippines, the Williams-Waterman Fund and Hoffmann-La Roche Inc., battled the situation — with complete success. Using Bataan as a test area, beriberi fatalities were halted and far fewer residents showed symptoms of the disease. This dramatic change came about by simply enriching the people's rice with vitamin B_1, niacin and iron. The promise of better health was thus demonstrated to millions of people all over the world.

More Proof. Further dramatic proof of the value of *enrichment* came from a decision of the Government of Newfoundland at the time it was an independent colony, before it became a Canadian province. Because it was known that dietary deficiency diseases, including beriberi, occurred among the people, the government decided that all white flour which entered the area must be enriched with vitamins B_1, B_2, niacin, iron and calcium.

At the time of this governmental decision a health survey by nutrition experts disclosed that deficiencies of many vitamins, including thiamine, were present in the test sample of more than 800 persons. Four years later these experts conducted a resurvey. They found that symptoms of vitamin deficiency were markedly reduced in number and less severe and recommended the continuation of white flour enrichment. This was done. A final note: when Newfoundland became a province of Canada, it required that enrichment be continued on the island although it was not yet an established practice in the rest of the dominion. Of course, in Canada today the practice of white flour enrichment with vitamins and minerals is widespread.



Good Food Sources. Cereal grains, beans, peas, nuts, wheat germ, and pork can make good contributions to our daily needs of vitamin B_1. Many other foods, too, contain the vitamin in varying amounts. Unmilled cereals are excellent sources of thiamine but no one eats raw wheat berries, rice kernels, or dried whole corn.

Consumers demand *white* flour, *white* bread, *white* rice. During the processing of these foods, natural vitamin values can disappear with parts of the grain that are milled out.

Inexpensive Health Insurance. A simple, practical, inexpensive way of insuring that these foods supply important vitamins has been in use for many years in the U.S.A. This is the *enrichment* of white flour, white bread and rolls, macaroni and spaghetti products, corn meal and corn grits, farina, and pastina with vitamin B_1 (thiamine), vitamin B_2 (riboflavin), niacin (another "B" vitamin) and iron. Sometimes calcium is included. Other grain foods, such as rice, may be *fortified* with vitamin B_1, niacin, and iron; or, as in the case of processed breakfast cereals, the vitamin B_1 content may be *restored* to whole grain levels.

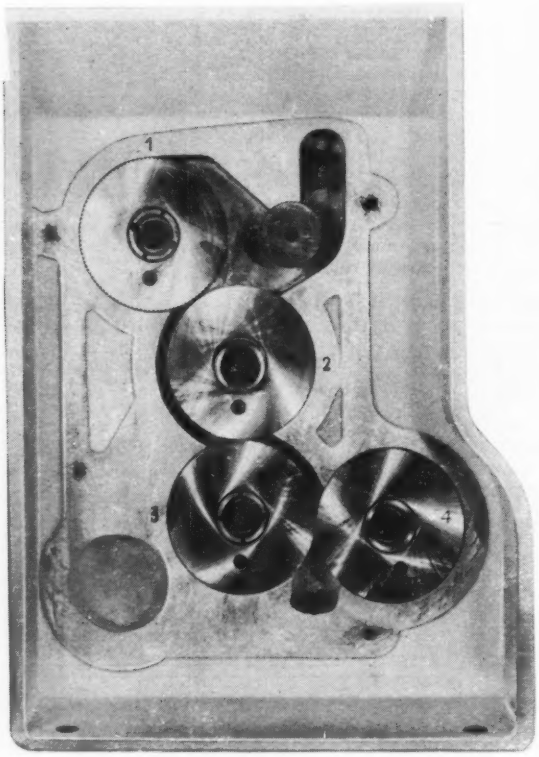
FREE REPRINTS. If you wish copies of this article and others in the series for reference or teaching, without obligation, just send your request to Dept. of Education, Fine Chemicals Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Limited, 1956 Bourdon Street, St. Laurent, Montreal 9, P. Q.

Roche® © 1960 HLR Inc.

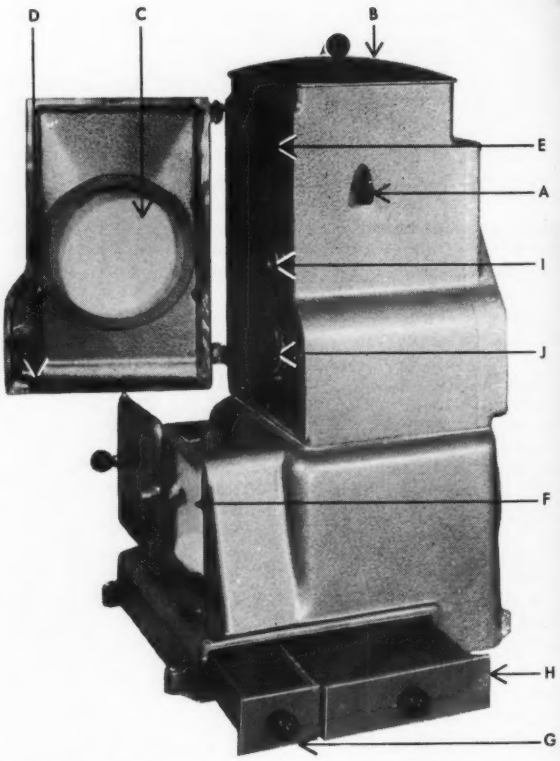
NOW! TABLE TOP MICRO-ROLLER TEST MILLING

C. W. BRABENDER QUADRUPLEX PILOT MILL

On the same wheat, there is no greater Farinogram difference on Quadruplex milled and commercially milled flour than between the flour from two commercial mills. The new C. W. Brabender Quadruplex Mill yields an average of 69% Hungarian. Grinding rate is 35 grams/minute — hopper holds 250 grams. Because the roll setting is fixed for all types of wheat, a skilled operator is not required. For purposes of research on wheat grind ability and yield, exchange rolls with various gaps and corrugations are available and interchangeable in one minute.



The quadruplex system of corrugated precision ground rolls — *corrugated after roll hardening.*



A. FEEDER CONTROL KNOB
B. FEED HOPPER
C. FILTER SILK SCREEN
D. FILTER DUST COLLECTOR TUBE
E. REMOVABLE COVER PLATE FOR MILL ROLL CLEANING
F. SIFTER CHAMBER
G. BRAN DRAWER
H. FLOUR DRAWER
I. ASPIRATOR BLOWER
J. ASPIRATOR ADJUSTOR

Self-contained. 16" x 19" x 28". Weight 41 lbs.
Operates on 220/440 Volt., 3 phase, 60 cycle.

C.W. Brabender **INSTRUMENTS, INC., SOUTH HACKENSACK, N. J.**

50 East Wesley Street, Diamond 3-8425

Write C. W. Brabender, president. His application knowledge is yours without obligation.

Editorial

MANY STATISTICS CAN be used to describe a national meeting of the American Association of Cereal Chemists. Commonly cited are the number of registrants, attendance at technical sessions and social functions, the number of papers presented, the number of exhibitors, decisions made in committee and business sessions, and the financial balance sheet figures. More difficult to determine, but even more pertinent to the achievement of such a meeting, would be a measure of the aggregate of all the benefits to each individual who attended, benefits in terms of enhanced professional competence and worth resulting from increased technical knowledge and better acquaintance with others who share a common scientific interest.

Much was accomplished at Chicago; nevertheless, future program planners must strive to blaze new trails and surpass previous accomplishments. Scientists today are frequently among outspoken critics of our educational system. How effectively is the educational function of most scientific meetings accomplished? As the membership of the AACC grows the educational activities may suffer unless a well directed effort is made to make them ever more efficient.

Some well-planned "market research" among those attending AACC meetings might be most helpful. What proportion of that which a speaker thinks he has communicated is actually understood by his audience? Do speakers present their subjects with the audience's background and interests in mind or only their own? Do they offer a product the customer wants or do they only seek to display their own specialized knowledge? What is the relative effectiveness of long versus short presentations, of manuscripts that are read versus those presented extemporaneously? Are program abstracts written so they aid understanding of a paper as it is presented? Would it be worth the trouble and cost to make copies of manuscripts and illustrative material available to the audience at the time of the presentation? When does audience fatigue nullify the best speaker's efforts? Should speaking ability along with subject matter be considered in deciding who is to have a place on the program? Which programs should be conducted concurrently?

As scientists we should be curious, imaginative, and willing to try innovations that hold promise of increasing our productivity in communication, as well as in the industry.

PAUL E. RAMSTAD

THE AACC PRESIDENT'S ADDRESS

Where Do We Go From Here?

By D. B. Pratt, Jr., The Pillsbury Co., Minneapolis, Minn.

TODAY THE AACC is 45 years of age. At this point we might well wonder just where we do go from here. Yet before we can move ahead, it is well that we pause in retrospect and study where we have been.

Forty-five years ago a very small group of chemists who were fundamentally trained for work in other branches of chemistry or related science banded together to form what has today grown to be an internationally recognized organization, authoritative in those areas of biochemistry related to all aspects of cereal grains. Our founding members were all scientists, men with inquisitive minds desirous of discussing with each other such meager information as was available at that time which would help them improve the products they were producing as well as establishing means of evaluating their raw material — wheat.

These dedicated men formed the nucleus of the organization which is ours today. The interest of these founding members of the AACC is evident in the fact that many of these founders are still active in cereal fields or have retired to a well-deserved rest after serving a full, active lifetime of work in the area of cereal chemistry. The closeness of interests of our membership has continued to exist, although the many new developments during our history have continually widened the horizon of our chosen field. It is particularly of interest to note that our membership list as of today still contains the names of some 161 men who have remained active members for 30 or more years; 63 of these have been active for 35 or more years. In addition, the Association lists 20 corporations who have supported our work for more than 30 years through corporate memberships. The membership list continues to grow.

AACC Publications

Our publications have grown in stature during our history to the point where CEREAL CHEMISTRY, our journal devoted to pure research, is internationally recognized and serves as a basic reference source in major technical libraries throughout the world. *Cereal Laboratory Methods*, now in its seventh printing, is our "best seller." Two ambitious monographs have been published which have received excellent acceptance in their respective areas.

For the past ten years it has been my privilege to serve the AACC as one of its officers. This meeting will mark the end of my service in an official capacity, but I look forward to the future and the opportunities it may bring me to help further our work in other ways.

When I first assumed office as Treasurer in 1950, my immediate predecessors in this office had made some changes in our busines operations to make them more modern and efficient. This move has, I feel, been a wise one and, though there is room for further streamlining, this decade of change has placed our Association on a businesslike basis.

Growth of the AACC

Our growth since 1949 is satisfactory. Let me cite some figures for you:

In 1949 active memberships numbered 864, total memberships were 986. In 1959 active memberships were 1,111 and total memberships 1,222. Circulation of CEREAL CHEMISTRY in 1949 was 1,809; in 1959 this had increased to 2,323 — an increase over and above the increase in membership of 300 subscribers, in the form of technical libraries. At the present time total combined circulation of CEREAL CHEMISTRY and the new CEREAL SCIENCE TODAY amounts to 5,800, of which 3,300 copies go to nonmembers. This is heartening to see, for it evidences the respect which our editorial efforts have achieved.

The Financial Picture

Total assets of the Association have decreased during the past 10 years, largely due to the increases we have had to face in normal operating costs such as printing, mailing, and office help. I am happy to report that this trend has now been reversed, and barring unforeseen circumstances should continue to hold on the plus side.

Further as regards financial matters: In 1949 the income of the Association was $38,477; expenses were $32,050 — a total cash handle of $70,527. In 1959 our income was $69,204 against expenses of $64,137, or a total handle of $133,341. These figures have doubled in ten years, and perhaps they best exemplify our growth, as well as the fact that the AACC has come of age and its operation is a big chore requiring a full-time staff which, I am happy to say, is doing an excellent job of handling the many details of our operation. Many of the functions of our officers have been transferred to our business offices, such as the details of our elections, billing and collection of dues and subscription monies, advertising sales, convention planning, technical editing, revision of *Cereal Laboratory Methods*, publication of our Monograph series, and preparation of materials for special projects such as the Farinograph Workshop.

Looking Forward

So much for where we have been. Now where do we go from here? We have already embarked upon an ambitious program so far as services to our members and industry are concerned. Monograph No. III, at the moment entitled *Cereal Chemistry*, is moving along at a good pace and we hope to publish this during 1961. A complete new *Cereal Laboratory Methods* is in the process of preparation and will reach the presses in 1961. Earlier I mentioned the total cash handled by our business offices in 1959 as $133,341. If publication of *Cereal Laboratory Methods* and Monograph No. III occur as planned, this cash handle for 1961 will swell to $151,000 and in 1962 to $190,000 to $225,000.

It is easy to see where we are going as a business organization. Looking at our technical program for this convention and the tremendous variety of subjects which will be reported and discussed, our technical progress will surely keep pace with our business growth.

During this past year your President has visited all of our local sections. I have found interested and active sections in every instance — enthusiastic feelings as to our future as professional people. In the message which I carried to our local sections I have tried to point out one of the ways in which we can move forward in the years ahead — communications. The men who are appearing on our program this morning will have more to say on this subject and others of equal importance. Our afternoon session today is intended as a provocative one in terms of "where we go from here" — challenging us as scientists to look further into the future.

Now as we move into our 45th annual meeting, may I challenge all of you to communicate freely with one another; and borrowing from the foreword of our program, may I again remind you that science is the inquisitive mind, as well as the accumulation of knowledge in a specific field of arts. Both of these ingredients are present here and now at this meeting. Make it your meeting and I am certain we will depart at its conclusion with a better conception of where we go from here.

NOW AVAILABLE

THE FARINOGRAPH HANDBOOK

- The Farinograph
- Theoretical Aspects of the Farinograph
- Types of Farinograph Curves
- Factors Influencing Farinograms
- Techniques and Uses of the Farinograph

Based on lectures presented at the AACC's 1st Farinograph Workshop, May 5-6, 1960, Chicago, Illinois. The only complete manual on the Farinograph ever published. A composite of the knowledge and experience of leading experts in the field of physical dough testing. Sponsored by the Physical Testing Methods Committee of the American Association of Cereal Chemists.

Price $5.00

ORDER FROM

AMERICAN ASSOCIATION OF CEREAL CHEMISTS

1955 University Avenue **St. Paul 4, Minnesota**

A SURVEY OF METHODS AND APPARATUS FOR

Moisture Measurement in the Grain Industry

By Lawrence Zeleny, Grain Division, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

MOISTURE CONTENT IS one of the most important factors affecting the quality of grain. Since the amount of dry matter in grain is inversely related to the amount of moisture it contains, moisture content is of direct economic importance. A carload of wheat of 14% moisture content contains about 1,850 gallons of water. Much of the wheat marketed in the United States contains about 14% moisture, although in the drier areas or in dry seasons the moisture content may be as low as 8%. At current prices the intrinsic value of a 55-ton carload of wheat of 8% moisture content would be about $250 greater than that of a carload of the same weight of similar wheat containing 14% moisture. Unfortunately, such differences in intrinsic value are seldom reflected in actual market prices. Thus farmers and others may be tempted to water their dry grain to increase its weight.

Of even greater significance is the effect of moisture on the keeping quality of grain. Dry, sound grain may be kept for years if properly stored, but wet grain may spoil completely within a few days. It is not possible, however, to set precise moisture limits for the safe storage of grain or to predict accurately how rapidly it will deteriorate at any given moisture content, because various factors other than moisture have marked effects on storage behavior. Nevertheless, under practical storage conditions, moisture content is usually the principal factor governing the keeping quality of grain. Near the critical moisture levels small differences in moisture content make large differences in keeping quality. Suitable methods for determining moisture content are therefore of considerable practical importance.

Basic Methods

Methods for determining grain moisture content which are generally classified as basic or primary methods are relatively accurate, but in general are too time-consuming for most practical purposes.

Oven Methods

The most widely recognized methods for determining moisture in grain are based on drying known weights of grain in various types of ovens and calculating moisture content from the weight lost in the drying operation. These methods appear to be rather simple and direct and usually constitute the "basic" methods against which rapid, practical moisture-testing equipment is calibrated. Actually, however, all oven methods for determining moisture in grain are more or less empirical in nature, the results depending on the degree of subdivision of the material being tested, the time of drying, and the temperature and atmospheric pressure under which the drying is accomplished. In most biological materials, including grain, it is difficult if not impossible to remove all moisture by the application of heat without at the same time driving off small amounts of other volatile substances or causing decomposition of some of the constituents with the formation and release of moisture not initially present as such.

The difficulty encountered in removing all moisture from biological material, even when it is finely ground, seems to be due principally to the fact that the water is present in different forms. When an inorganic material such as wet sand is heated at 100°C. or higher at atmospheric pressure, the moisture is lost at a rapid and essentially uniform rate until the material is completely dry. In drying finely ground grain, however, a much longer time is required to remove the moisture, the rate of moisture loss decreases rapidly as the drying progresses, and the ultimate loss in weight differs with different temperatures employed for drying.

In biological materials such as grain, part of the moisture present appears to be tightly held or "bound" by powerful physical forces to proteins, high-molecular-weight carbohydrates, and perhaps other colloidal substances. This moisture, sometimes spoken of as "bound" water, is much more difficult to remove than the "free" water. The tenacity with which water may be held to colloidal substances probably varies with the nature of the colloidal material and with the amount of water so held. Thus in the case of wet grain there are probably encountered all gradations between "free" water that is removed by heat as readily as the water from wet sand, and water that is so tightly held that it can be removed only under conditions of temperature and pressure that may permit volatilization or decomposition of other constituents. For these reasons oven methods as well as most other "basic" methods for determining moisture in grain are actually empirical, and to obtain comparable results standard procedures that have been usually rather arbitrarily established must be followed precisely.

Air-Oven Methods

In this method a weighed portion of finely ground grain is heated in an

air oven for 1 hour at 130° C. The loss of weight determined is widely used for determining moisture in cereal grains, and this is the basic method specified for grains other than corn in the official grain standards of the United States (22). If the initial moisture content of the grain is in excess of 13%, a two-stage procedure is used in which a weighed portion of grain is partially dried to a moisture content of less than 13% before grinding, and the loss of weight in this preliminary drying is determined. The partially dried grain is then ground and a weighed portion of the ground material is dried for 1 hour at 130° C. In calculating the moisture content, the moisture losses in both stages of the procedure must be taken into consideration.

Another commonly used air-oven method for determining moisture in grain provides for heating a weighed portion of the finely ground grain for 2 hours at 135° C. This method gives slightly higher results than the previously described method and is an official method of analysis for grain of the Association of Official Agricultural Chemists (1).

In addition to the conventional types of air oven, special types are available which have built-in balances for weighing dried samples while they are still hot and without removing them from the oven. In some instances the balances may be used also for the initial weighings and are calibrated directly in terms of moisture percentage so that when the proper weight of sample is used no calculation is required.

Water-Oven Method

Under the official grain standards of the United States a water-oven method (22) is specified as the official basic method for the determination of moisture in corn. A weighed quantity of whole corn is dried for 96 hours at 99° to 100° C. in a water-jacketed oven in which the water is maintained at the boiling temperature. The water oven is essentially an air oven except that it is heated by means of boiling water. Effective October 1, 1959, the water-oven method for corn was replaced by an air-oven method (23).

Vacuum-Oven Method

One of the most widely accepted methods for determining the moisture content of grain is based on drying the finely ground grain at 98° to 100° C. in an oven chamber maintained at pressure of 25 mm. or less of mercury. Heating is continued until no appreciable further loss of weight occurs (usually about 5 hours). This method is one of the official methods of the Association of Official Agricultural Chemists for grain (1) and gives results in reasonably good agreement with the 1-hour, 130° C. air-oven method.

Drying with Desiccants

The moisture content of grain and other materials may be determined by placing a weighed portion of the finely ground material in a closed container with a relatively large quantity of an efficient desiccant. The desiccant chosen must have a lower vapor tension than the material being dried. The moisture in the material is gradually vaporized, and is then absorbed by the desiccant. Moisture content is determined by the loss in weight of the original material after it finally attains constant weight. Reducing and maintaining the atmospheric pressure in the container to a low level will greatly reduce the time required to complete the operation, but even when this is done the time required is too great for most practical purposes. However, in one of the official methods of the Association of Official Agricultural Chemists for determining moisture in grain, the finely ground material is held under vacuum in the presence of anhydrous sulfuric acid until constant weight is attained (1). One advantage of the method is that it does not involve the hazard of possible decomposition of organic material by heat. However, grain of high moisture content may decompose as a result of the action of molds and bacteria before the moisture content is reduced sufficiently to inhibit the growth of these organisms.

Toluene Distillation Method

One of the official methods of the Association of Official Agricultural Chemists (1) provides for boiling the finely ground grain in toluene in an apparatus that condenses the volatilized materials, collects the condensed water in a graduated tube, and returns the condensed toluene to the boiling flask. The boiling is continued as long as any water accumulates in the graduated tube, and the moisture content of the grain is calculated from the volume of water condensed. Since the boiling point of toluene is 111° C., all substances that boil at or below this temperature, including all water that will be released at this temperature, are distilled. Also, since the water is measured volumetrically, no water-in-soluble volatile material can be measured as moisture. A modification of this method has been adopted for corn by the corn wet-milling industry.

Karl Fischer Method

In recent years considerable attention has been given to the method of Karl Fischer (8) for determining the moisture content of a wide variety of materials. The method depends upon the reaction of iodine with water in the presence of sulfur dioxide and pyridine to form hydriodic acid and sulfuric acid. Since the method is strictly stoichiometric, it is, theoretically at least, one of the most accurate methods for determining moisture. In applying the method to grain, the grain must first be finely ground and the moisture extracted with anhydrous methyl alcohol. Because of certain practical difficulties in its application, the Karl Fischer method has been used but little in determining moisture in grain, although Fosnot and Hamon (9) have applied the method to wheat and barley. More recently Hart and Neustadt (11) have successfully adapted the method to all cereal grains and have used it to test the accuracy of official oven methods. Because of the technical skill required and the time-consuming nature of this analytical method, its usefulness is likely to remain quite limited, even though it is probably the most accurate method available.

Practical Methods

Practical methods designed for rapid routine determination of grain moisture content are for the most part secondary or indirect methods which must be standardized against one of the basic or primary methods.

Brown-Duvel Distillation

For many years moisture content was determined in routine inspection of grain by heating a weighed portion of unground grain in oil. The moisture volatilized by this heating is condensed, then collected and meas-

ured in a graduated cylinder. The apparatus used for this purpose must be standardized to provide a definite amount of heat in a definite period of time. The method is highly arbitrary and the exact procedure to be followed must be established for each kind of grain in order to obtain results equivalent to those obtained by the applicable official oven method. The method was first proposed by Brown and Duvel (3) and the procedure to be followed for each kind of grain is described in detail in U. S. Department of Agriculture Department Bulletin No. 1375 (5).

The Brown-Duvel method has been largely replaced by electric moisture meters in routine inspection of grain in the United States, but it is still used under various conditions of testing in which electric meters cannot be depended upon to give reliable results.

Direct Heating

Various modified air-oven methods using special heating equipment have been devised to shorten the time required as compared with standard oven methods. In general these methods provide for heating the material to considerably higher temperatures than those employed in the usual oven methods. Heating may be accomplished by ordinary electric heating coils, by radiation from infrared radiators, or by means of a high-frequency, high-voltage field (4). In employing these methods and devices, it is customary to determine in advance the time of heating and the temperature or other adjustment of the equipment required for each type of material to be tested in order to obtain results in reasonably good agreement with those obtained by one of the more basic methods.

Calcium Carbide Methods

Calcium carbide reacts readily and completely with water to form calcium hydroxide and acetylene gas. Parks (16) was the first to utilize this reaction as a basis for determining the moisture content of plant materials. An excess of calcium carbide is mixed with a definite weight of plant material. The moisture in the material being tested reacts with the calcium carbide, and the acetylene gas formed escapes from the mixture. The moisture content of the material is then calculated from the weight lost as a result of the escaped gas. A special balance for making the weighings was devised, with which the final reading is made directly in terms of percent moisture. Although the method is theoretically sound, practical difficulties appear to have prevented any extensive use of it in the testing of grain.

A moisture-testing device is available in which the material to be tested is mixed with calcium carbide in a tightly sealed, heavy metal container equipped with a pressure gage. For any given type of plant material the pressure developed by the evolution of acetylene gas should be proportional to the moisture content of the material. This method with its equipment is said to be in limited use for measuring the moisture content of grain.

Dichromate Method

A method for measuring the moisture content of fruits and vegetables based on oxidation of the organic material by potassium dichromate has been proposed by Launer and Tomimatsu (14). An excess of dichromate is used in the reaction, and the part that remains after oxidation is complete is determined by titration. A "dichromate factor" is established for each type of product to be tested and is based on results obtained by a standard oven method for determining moisture. Although the method is intended primarily for products of high moisture content, it was shown to be applicable to rice containing from 10 to 15% moisture (21). Presumably it could be used for other grains.

Methods Based on Relative Humidity Measurement

When grain is freely exposed to the air it will gradually lose or gain in moisture content until it reaches a moisture content level in equilibrium with the relative humidity of the air to which it is exposed. Likewise the interstitial air in unventilated stored grain will tend to become stabilized at a relative humidity in equilibrium with the moisture content of the grain. Thus after this equilibrium is established a measurement of the relative humidity of the interstitial air may be used as an index of the moisture content of the grain. Actually such relative humidity measurements may be better indexes of the keeping quality of grain than direct moisture-content measurements, since the activity of molds and other microorganisms that develop on the surfaces of grain kernels and that are largely responsible for grain spoilage is probably more closely dependent upon the relative humidity of the surrounding air than upon the moisture content of the grain. It has been shown by Milner and Geddes (15) that the rate of mold development on grain is quite slow when the relative humidity is below 75%, but that rapid deterioration as a result of mold growth is likely to occur at ordinary temperatures if the relative humidity of the interstitial air is greater than 75%. For long storage the moisture content should be low enough so that the relative humidity is considerably below 75%, probably below 65%.

Wet- and dry-bulb thermometers have been used by Gaus, Shaw, and Kliever (10) to determine the moisture content of seed cotton prior to ginning by measuring the relative humidity of air drawn by suction from bulk lots of the product. Dexter (7) has applied the wet- and dry-bulb technique to small samples of grain and other agricultural products, using saturated salt solutions rather than water on the bulb of the wet-bulb thermometer. Manufacturers of electric hygrometers are investigating the application of these devices to the measurement of moisture in grain and other products.

Ives (13) has made ingenious use of dew-point depression as a measure of relative humidity in a closed jar of grain and hence of the moisture content of the grain.

Certain inorganic salts, notably those of cobalt, undergo marked changes in color at different relative humidity levels as a result of differing degrees of hydration. Practical use of this phenomenon has been made by Solomon (19, 20) in estimating the relative humidity of air in small spaces and by Dexter (6) in estimating the moisture content and keeping quality of grain and other farm products. Although the accuracy of any such method is not high, its simplicity may make it valuable for farm use.

In order to translate relative humidity measurements into terms of grain moisture content, it is obviously necessary to know the relationship between relative humidity and grain moisture. This relationship differs

for different kinds of grain, and to some extent among different lots of the same kind of grain, probably because of the effect of hysteresis and of differences in the tenacity with which part of the water is held by colloidal constituents. Although various investigators have published data in respect to these relationships, there is a considerable amount of disagreement among the published reports. Perhaps the most thorough study of this subject is that of Hubbard, Earle, and Senti (12).

Electric Moisture Meters

Certain electrical properties of grain depend largely on its moisture content and have been used as the basis for a considerable number of devices for determining moisture content.

The possibility of determining the moisture content of grain by resistance measurements was first demonstrated by Briggs in 1908 (2). Using as electrodes 12-in. brass rods inserted into a jar of wheat, and measuring with a Wheatstone bridge the resistance of the wheat to the flow of current from an electromotive force of 17 volts, he found a linear relationship between the moisture content of the wheat and the logarithm of its resistance over the moisture range of about 11 to 16%. He also showed the effect of temperature on the electrical resistance of wheat.

In 1909 Zeleny (24) devised an electrical instrument for determining the moisture content of corn. Electrodes in the form of spaced metal points were pressed into the germs of individual kernels of corn. The two electrodes were of dissimilar metals, so that with the corn kernel they formed a simple voltaic battery. The current produced depended upon the moisture content of the corn and was registered on a sensitive galvanometer. Thus no battery or other external source of current was required. In a later modification of the instrument a battery was added to the circuit and the electrodes were both made of the same metal, so that the galvanometer deflection became essentially a measure of conductivity of the corn kernel.

Although neither the Briggs nor the Zeleny device was used extensively for practical purposes, they stimulated interest in electric grain moisture testing and were the forerunners of a considerable number of electric moisture meters that are now widely used in the grain trade. Most of the modern meters are based on conductance or capacitance measurements.[1]

Conductance-Type Moisture Meters

In conductance-type moisture meters the grain is pressed between two electrodes connected in series with a suitable source of current and a galvanometer. A series of fixed resistors may be introduced individually into the circuit so that the full range of the galvanometer may be utilized for separate relatively narrow ranges in moisture content.

In one style of conductivity meter a weighed or measured portion of grain is pressed to a standard thickness between two electrodes in a small cylinder. In another style of meter, widely used in the inspection of grain under the official grain standards of the United States, the electrodes are in the form of corrugated steel rolls, one of which is motor-driven. The grain, which need not be weighed or measured, is simply poured between the two rolls, which are accurately spaced with respect to each other, and which then rotate in opposite directions and subject the grain passing between them to high pressure.

Conductance-type moisture meters are relatively easy to keep in proper adjustment and to maintain in satisfactory alignment with one another. They are likewise very rapid in operation, particularly the style of meter using motor-driven electrodes. One of the principal disadvantages of conductance meters is that their accuracy is dependent in large measure upon a normal distribution of moisture within the kernels of grain. Grain that has recently been dried artificially gives low readings, since the surfaces of the kernels are abnormally dry in respect to the moisture content of the grain as a whole. Likewise freshly tempered (moistened) grain gives high readings because of an excess of surface moisture. Mixtures of wet and dry grain and grain that is musty or sour also often fail to give correct readings with conductance-type meters. Furthermore, conductance meters are quite limited in the range in grain moisture content they will measure. At moisture levels below about 7% moisture in grain appears to be so tightly "bound" that it contributes very little to the conductivity, hence no satisfactory readings can be obtained at such levels. At moisture levels above about 23%, grain conductivity is so great it increases but little with further increase in moisture content. At these moisture levels, therefore, conductance meters are subject to serious errors.

Capacitance-Type Moisture Meters

Since the dielectric properties of grain depend largely on its moisture content, the capacity of a condenser in which grain is the dielectric will vary in accordance with the moisture content of the grain. This principle has been utilized in the development of a number of different grain moisture meters. In some of them the circuits are so designed as to utilize the change in impedance resulting from the change in capacitance as a means of measuring the moisture content. Impedance decreases with increasing grain moisture content as a result of the effect of the moisture on the dielectric properties of the grain.

Moisture meters of this type have certain inherent advantages over conductance-type meters. They are less subject than conductance meters to errors resulting from uneven moisture distribution within or among the kernels of the grain being tested, and to errors associated with mustiness or sourness of grain. They are also capable of testing grain over a wider range of moisture content than are conductance meters. In spite of these advantages, it has never been conclusively proved that capacitance-type moisture meters are capable of greater over-all accuracy in testing the normal run of commercial grain than are conductance meters. Capacitance meters should be particularly useful, however, in testing freshly dried or tempered grain, mixtures of wet and dry grain, out-of-condition grain, and grain of very high or low moisture content.

Good replicability of results is somewhat more difficult to obtain with capacitance meters than with conductance meters, particularly in the higher moisture ranges. This appears to be due to a degree of nonuniformity in the packing and orien-

[1] A partial list of moisture-testing devices for grain and related commodities is maintained by the author and can be obtained upon request.

tation of the grain kernels when they are dropped into position between the plates of the condenser. Another serious practical disadvantage encountered with many capacitance moisture meters is the difficulty in keeping them in proper adjustment, particularly in maintaining accurate alignment among individual instruments. Uniformity of results obtained among many different inspection offices is of paramount importance in routine grain inspection work. Satisfactory uniformity has been more easily attained with conductance than with capacitance meters. Marked improvements, however, are being made in capacitance meters both in respect to precision in manufacture and to means for maintaining proper adjustment and alignment.

Nuclear Magnetic Resonance Method

A relatively recent development is the observation of Shaw and Elsken (18) that the magnetic resonance absorption due to hydrogen nuclei can be used to measure the moisture content of various materials. Equipment for determining moisture content by means of this principle is described by Rubin (17). Although this method is rapid and may be the most accurate of the various secondary methods for determining grain moisture content, the present cost of the essential equipment would prohibit its adoption for most routine use.

Maintaining Accuracy in Practical Moisture Testing

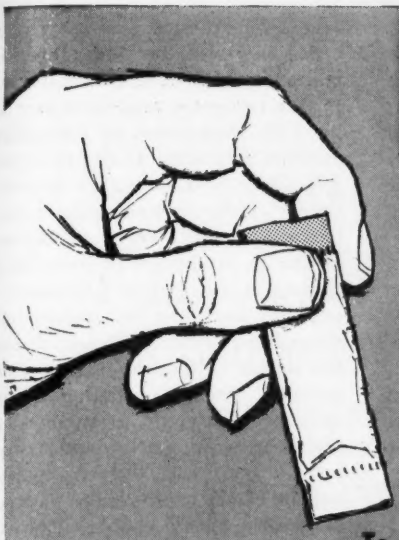
Since moisture content is an important factor in the marketing of grain, it is necessary that the greatest possible accuracy be maintained, consistent with practical operations, in the determination of moisture. Failure to maintain reasonable accuracy may result in injustices in grain marketing transactions and in spoilage of grain during shipment and storage. Several state governments are exercising or are planning to exercise some degree of control within their respective states over all grain moisture-testing operations performed in connection with the marketing of grain. The basic plan usually contemplated is to check periodically the accuracy of all moisture-testing devices used within the state for this purpose and to approve or license the use of only those that meet or that are adjusted to meet certain standards of accuracy. For reasons that will be outlined below, a program of this kind is much more complicated than it might seem to be. It cannot be considered comparable with the task of checking the accuracy of scales for determining weight or of containers for measuring volume.

Nearly all practical grain moisture-testing devices are calibrated against basic oven methods, usually those prescribed by the Official Grain Standards of the United States. It might seem, therefore, that a logical system for a state to use in checking the accuracy of practical moisture-testing devices would consist simply of using samples of the different grains, the moisture contents of which have been established accurately by official oven methods. Under such a system those devices, and only those, giving results in agreement with the established moisture content within a specified tolerance would be acceptable. This system should prove to be reliable when it is applied to the numerous devices available for determining the moisture content of grain by distilling the moisture and measuring the volume of condensed water so obtained, or by evaporating the moisture rapidly by heat produced by heating coils, infrared radiation, or high-frequency, high-voltage fields, and then determining the weight loss. All of these devices are potentially capable of yielding fairly accurate results consistently, and failure of the devices to yield results checking quite closely with official oven methods is immediately indicative of mechanical, electrical, calibrational, or operational defects. Devices falling into this category, however, are not widely used in practical grain operations because they are much slower and less convenient to use than electric meters.

Electric grain moisture meters are, and will no doubt continue to be, widely used because of their great convenience, regardless of the fact that they are at times somewhat inaccurate. These meters do not in reality measure grain moisture content directly but, rather, measure certain electrical properties of grain that are related to moisture content. Since many variable factors other than moisture content affect these electrical properties, electric meters are subject to certain inherent inaccuracies which are sometimes much greater than is generally realized. Reliable calibration of any make and model of electric meter must therefore be based on tests made on large numbers of samples of each kind and sometimes each class of each kind of grain, covering wide ranges in moisture content and area of production, and produced during several crop years. Each sample must be tested by the appropriate basic method and the corresponding meter reading ascertained. From the data so obtained the best possible calibration is derived. Although the resulting calibration chart, table, or scale should make it possible to determine grain moisture content accurately *on the average*, tests on individual samples of grain may be in error by considerable amounts. Frequently all samples of one kind of grain from a particular limited area of production during a particular season or part of a season will show uniformly high or low test results when tested by a particular kind of moisture meter, even though the meter is properly calibrated for the crop as a whole and properly operated. The unknown variable factors which are responsible for this phenomenon might not affect the readings of other types of electric meters in the same way.

In any program that may be developed for checking the accuracy of electric grain moisture meters, the above-mentioned types of apparently unavoidable and unpredictable errors in moisture determination must be considered. If check tests are to be based on grain samples of known moisture content, it would be necessary to use very large numbers of samples to minimize the possibility of arriving at false conclusions resulting from abnormal characteristics of the samples chosen. Checking moisture meters by means of grain samples of known moisture content should provide the most reliable meter inspection system if the agency performing this inspection is prepared to use a sufficiently large and diversified group of grain samples for this purpose. If only a small number of samples is used, the chances of arriving at false conclusions in respect to the reliability of meters are relatively great.

Although the task of inspecting meters properly by the use of samples of known moisture content would

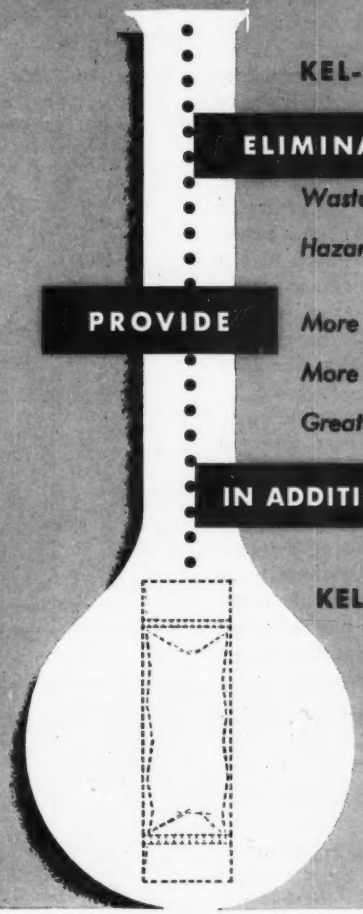


FOR YOUR CONVENIENCE

Harshaw KEL-PAK Digestion Catalyst Powders

Harshaw KEL-PAK Powders are carefully compounded mixtures of Potassium Sulphate; Mercuric Oxide and/or Copper Sulphate in sealed polyethylene packets containing sufficient catalyst for one protein determination.

To use, simply drop one packet into flask



KEL-PAK POWDERS

ELIMINATE *Messy mixing operations*

Waste due to spillage and spoilage

Hazardous handling of mercury or its compounds

PROVIDE *More uniform mixtures*

More accurate additions

Greater speed in adding catalyst to flask

IN ADDITION.. *Polyethylene packet reduces foaming*

KEL-PAK POWDERS are available in 5 formulas

#1 9.9 grams K_2SO_4; .41 gram H_gO; .08 $CuSO_4$
#2 10 grams K_2SO_4; .3 gram $CuSO_4$*
#3 9 grams K_2SO_4; .35 gram H_gO*
#4 10 grams K_2SO_4; .7 gram H_gO*
#5 15 grams K_2SO_4; .7 gram H_gO*
* Meet A.O.A.C. specifications

Write for more information and prices today.

HARSHAW SCIENTIFIC
DIVISION OF THE HARSHAW CHEMICAL CO.
1945 East 97th Street • Cleveland 6, Ohio

Sales Branches and Warehouses

Cleveland 6, Ohio, 1945 East 97th St.
Cincinnati 13, Ohio, 6265 Wiehe Road
Detroit 28, Mich., 9240 Hubbell Ave.
Houston 11, Texas, 6622 Supply Row
Los Angeles 22, Calif., 3237 S. Garfield Ave.
Philadelphia 48, Pa., Jackson & Swanson Sts.
Sales Offices: Baton Rouge, La.• Buffalo 2, N.Y.• Pittsburgh 22, Pa.• Oakland 11, Calif. Hastings-on-Hudson 6, N.Y.

usually be considered impractical for the reasons stated above, we believe that there may be a more practical approach to the problem which would utilize, as far as possible, information already known about many of the meters as well as certain facilities that could be made available by the manufacturers or distributors of the meters. The suggested plan would be broken down into the following five phases:

1. Ascertain which makes and models of meters are potentially capable of determining grain moisture content within the tolerances desired. No other makes or models would be considered acceptable until suitable evidence of their reliability could be obtained.

2. Make certain that reliable conversion charts, tables, or scales for these meters have been provided and that they are actually being used.

3. Obtain for use by the state agency responsible for the meter inspection one meter of each make and model that is considered acceptable and that is actually being used in the state.

4. Make sure that these "standard" instruments maintained by the state will give readings essentially identical with those of "master" instruments of the same makes and models that are usually maintained by the manufacturers or distributors. This can be accomplished only through an exchange of grain samples between the state and the firms or agency maintaining the "master" instruments. A few samples of each kind of grain will usually suffice for this purpose and no knowledge of the actual moisture content of the samples is necessary. Checks of this kind should be made at rather frequent intervals.

5. Perform the inspection of moisture meters throughout the state by checking the moisture content readings obtained by these meters against those obtained by the "standard" meters of the same makes and models maintained by the state agency. Here again a few samples of grain are sufficient and no knowledge of the exact moisture content of the grain is necessary. Each "standard" meter must be used only for checking other meters of the same make and model. In each instance comparative tests with the two meters should be made on the same day if possible.

The above-described plan, if properly put into effect, should make it possible to maintain within a state a reasonable degree of accuracy in electric grain moisture testing. It should provide a high degree of uniformity of results among meters of the same make and model. It should also provide for satisfactory *average* agreement among all approved makes and models of meters. The plan cannot be expected, however, to eliminate occasional fairly wide differences in results obtained among different makes or models of meters or occasional rather serious inaccuracies in results obtained by any make or model of meter.

This method of maintaining grain moisture-testing uniformity as well as a reasonable degree of accuracy is essentially that used by the U.S. Department of Agriculture. A single make of conductance-type moisture meter is used almost exclusively by licensed grain inspectors in the inspection of grain under the Official Grain Standards of the United States. By means of frequent exchanges of samples the meters in 47 grain supervision offices and suboffices of the Department are kept in almost perfect alignment with a "master" instrument maintained at Chicago. In a similar manner the meters used by licensed inspectors at 325 grain inspection points throughout the country are kept in alignment with the meters at their respective supervision offices. Thus all of the meters are kept in alignment with the master machine at Chicago. This phase of the program maintains good uniformity in moisture testing throughout the country but has little to do with ensuring the accuracy of the moisture values obtained.

To ensure the greatest possible accuracy, the conversion tables that have been established to convert meter readings into moisture percentages are under constant surveillance by the Department through a carefully planned and continuous system of checking meter readings for all grains against moisture percentages obtained by the official basic oven methods. In many instances the relation between moisture content and electric properties is found to undergo a progressive change from year to year as a result of the introduction of new varieties of grain and new methods of harvesting and handling. These changes must be carefully followed in order that the conversion tables may be revised when necessary.

This two-phase procedure used by the U.S. Department of Agriculture provides a satisfactory degree of uniformity in electric grain moisture testing among licensed grain inspectors and as great a degree of accuracy as can be attained with the type of equipment used. Greater accuracy in practical work can be attained only through the further perfection of electric meters or the use of other more accurate methods of testing. Manufacturers of electric grain moisture meters are making considerable progress in improving their equipment, but the extent to which the accuracy of electric meters can be improved may be limited by inherent sources of error that may be very difficult to eliminate.

Literature Cited

1. Association of Official Agricultural Chemists. Official methods of analysis (8th ed.). The Association: Washington, D. C. (1955).
2. Briggs, L. J. U. S. Dept. Agr., Bur. Plant Ind., Circ. 20 (1908).
3. Brown, E., and Duvel, J. W. T. U. S. Dept. Agr., Bur. Plant Ind., Bull. 99 (1907).
4. Christie, A. U. S. Patent No. 2,360,108 (1944).
5. Coleman, D. A., and Boerner, E. G. U. S. Dept. Agr., Dept. Bull. 1375 (rev.); mimeo. (1936).
6. Dexter, S. T. *Mich. Agr. Exp. Sta. Quart. Bull. 30:* 422 (1948).
7. Dexter, S. T. *Mich. Agri. Exp. Sta. Quart. Bull. 31:* 275 (1949).
8. Fischer, K. *Angew. Chem. 48:* 394 (1935).
9. Fosnot, R. H., and Hamon, R. W. *Cereal Chem. 22:* 41 (1945).
10. Gaus, G. E., Shaw, C. S., and Klievер, W. H. U. S. Dept. Agr., Circ. 621 (1941).
11. Hart, J. R., and Neustadt, M. H. *Cereal Chem. 34:* 26 (1957).
12. Hubbard, J. E., Earle, F. R., and Senti, F. R. *Cereal Chem. 34:* 422 (1957).
13. Ives, N. C. *Agr. Eng. 33:* 85 (1952).
14. Launer, H. F., and Tomimatsu, Y. *Food Technol. 6:* 59 (1952).
15. Milner, M., and Geddes, W. F. *Cereal Chem. 23:* 225 (1946).
16. Parks, R. Q. *J. Am. Soc. Agron. 33:* 325 (1941).
17. Rubin, H. *Cereal Sci. Today 3:* 240 (1958).
18. Shaw, T. M., and Elsken, R. H. *J. Chem. Physics 18:* 1113 (1950).
19. Solomon, M. E. *Ann. Appl. Biol. 32:* 75 (1945).
20. Solomon, M. E. *Bull. Entomol. Research 48:* 489 (1957).
21. Tomimatsu, Y., and Launer, H. F. *Food Technol. 6:* 281 (1952).
22. U. S. Department of Agriculture. Service and Regulatory Announcements, No. 147 (rev. 1941).
23. U. S. Department of Agriculture. Service and Regulatory Announcements, No. 147 (rev. 1959).
24. Zeleny, A. *Minn. Engineer 17:* 163 (1909).

Controlled FLEXIBILITY

FOR CUSTOM DESIGNED, SPECIALIZED SHORTENINGS

Flexibility in the manufacture of shortening? . . . Oh, yes, that's the ability to produce *any* type, *any* amount of special formula shortening—quickly, and precisely to specification.

Not only is this HumKo Products' ability, it's HumKo's *proven record* of performance. Further, it's good reason why HumKo Products is one of the nation's largest suppliers of a variety of shortening products.

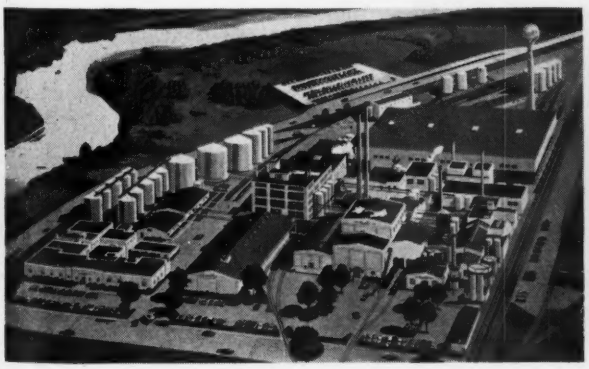
With unsurpassed manufacturing and research facilities—supervised by skilled shortening specialists—HumKo *makes more than a dozen different specialized shortenings every day.** HumKo also provides *helpful* technical service, quick delivery, and at lowest possible cost.

Find out how HumKo's "controlled flexibility" can become the answer to *your* specialized shortening problem.

**Such special formulas include: cracker, potato chip, and doughnut types, shortenings for the prepared mix industry, high emulsifying types of hydrogenated vegetable or meat fat shortenings for virtually every food use.*

HUMKO PRODUCTS

GENERAL OFFICES
MEMPHIS, TENNESSEE



General Offices and Main Plant—Memphis, Tennessee

Midwestern Plant—Champaign-Urbana, Illinois

AACC IN CHICAGO

WESTERN UNION
TELEGRAM

R WA513 LONG GOVT. NL PD
THE WHITE HOUSE
WASHINGTON D.C. 28
D. B. PRATT, JR.
PRESIDENT
AMERICAN ASSOCIATION OF CEREAL CHEMISTS
c/ MORRISON HOTEL
CHICAGO

IT IS A PLEASURE TO SEND GREETINGS TO THE MEMBERS AND GUESTS OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS ASSEMBLED AT THEIR ANNUAL CONFERENCE.

MORE EFFICIENT PRODUCTION AND MARKETING OF CEREALS AND OTHER FARM PRODUCTS — WHICH PROGRESS IN SCIENCE HAS MADE POSSIBLE — IS BASIC TO THE AGRICULTURAL ECONOMY OF OUR LAND AND THE WORLD. TO MEET THE REQUIREMENTS OF AN EXPANDING POPULATION, FURTHER INCREASES IN FARMING EFFICIENCY ARE NEEDED AND CAN BE ACHIEVED THROUGH RESEARCH. BUT THE OBJECTIVES OF AGRICULTURAL SCIENCE INCLUDE ALSO THE DISCOVERY AND DEVELOPMENT OF NEW USES AND EXPANDED MARKETS FOR FARM PRODUCTS. INTENSIFIED EFFORTS ALONG THIS LINE ARE REQUIRED TO ENABLE THE UNITED STATES TO MAKE FULLER AND MORE EFFECTIVE USE OF ITS AGRICULTURAL ABUNDANCE.

I AM DELIGHTED TO ADD BEST WISHES FOR A FINE CONFERENCE. DWIGHT D. EISENHOWER.

THE AMERICAN ASSOCIATION of Cereal Chemists held their most successful convention in recent years when they met in Chicago during the week of May 1-5. Registration figures indicate that this 45th Annual Meeting will be one of the largest in history with 658 members and guests registered accompanied by 101 ladies.

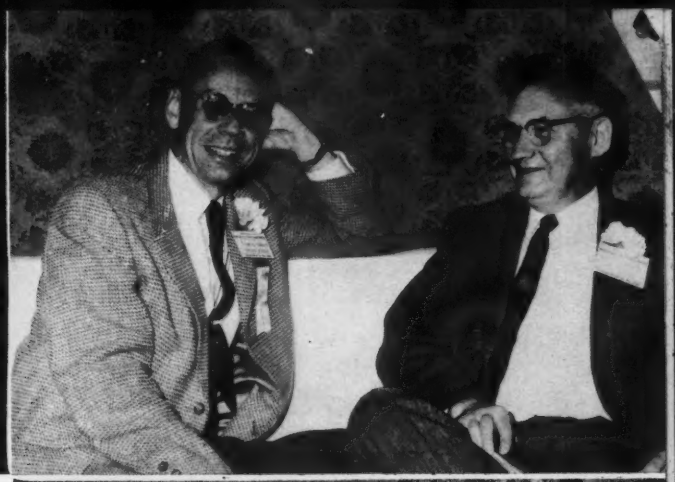
Records were set with 73 technical papers being presented and 18 exhibitors on hand to display the latest in equipment and supplies. Among the new items shown was the Udy Protein Analyzer displayed by Hegman, Inc. of Minneapolis and the Quadruplex Pilot Mill manufactured by C. W. Brabender Instruments, Inc., of South Hackensack, N. J. This later item is a table top micro-roller mill for milling small quantities of wheat.

President D. B. Pratt, Jr., The Pillsbury Co., gave the keynote address (see p. 128). Three prominent guest speakers, W. E. Glennon, executive president of the American Feed Manufacturers Association, Ellis D. English, president of Commander Larabee Milling Co., and Albert R. Whitman, president of Campbell-Mithun, Inc., highlighted the 4-day meeting.

Program Chairman Robert Koch and Local Arrangements Chairman Edward Feigon assembled top-notch committees to carry out the many details involved in a meeting of this size. The excellence of the technical program and general arrangements are evidence of exceptionally fine planning.

The meeting also set records socially. The best attended Sunday evening mixer and President's Reception was held in the Morrison Hotel's Cotillion - Embassy room. The largest banquet in AACC history, 567 guests, was the highlight of the planned social events. This year's flour judging contest utilized rye flour and was won by John T. Buckheit of Standard Brands. The winner of the drawing for exhibits door prize was Dr. Leland A. Underkofler, Miles Chemical Co. Dr. Underkofler won an electric coffee maker.

New officers and directors of the AACC for the year 1960 to 1961. Top, left to right, D. B. Pratt, Jr., retiring President; Marjorie A. Howe, Treasurer; James W. Pence, Secretary; James W. Evans, President-Elect. Bottom: Left to right, L. L. Warren, Director; Glenn E. Findley, Director; J. S. Schlessinger, Director; John W. Giertz, Director.



Upper left. Betty Sullivan, Russell-Miller Milling Company, and Byron S. Miller, Kanssa State University, discuss plans for the 1961 meeting in Dallas. Dr. Miller will be program chairman at that time.

Upper right. Frank R. Schwain, Procter & Gamble Company, and C. A. Nelson, Mennel Milling Company, enjoy a few minutes of relaxation between technical presentations.

Kenneth A. Gilles, General Mills, Inc., and Russell J. Stenberg, Northern Utilization Research & Development Division, interrupted by the photographer while discussing "old times" as graduate students at the University of Minnesota.

John A. Shellenberger, Kansas State University, and Allan D. Shand, D. H. Brown & Sons, Ltd., (New Zealand) get acquainted and talk over plans for Mr. Shand's visit to Kansas State and other prominent centers in the United States.

Bottom right. Left to right, H. Wright, Beatrice Foods Co.; C. M. O'Malley, Dry Milks, Inc.; and E. F. Budde, Quaker Oats Company, gather for a brief chat in front of the AACC's registration desk.

Bottom left. Left to right, C. G. Harrel, consultant; Dale W. Johnson, Central Soya Company; David L. Carpenter, Pillsbury Company; H. W. Skinner, C. W. Skinner Company.

E. I. DU PONT CO. • Lawrence Fullhart, E. I. duPont de Nemours & Co., center, talks with W. G. Mumford, Hercules Powder Co., and John Harrison, Hercules Powder Co.

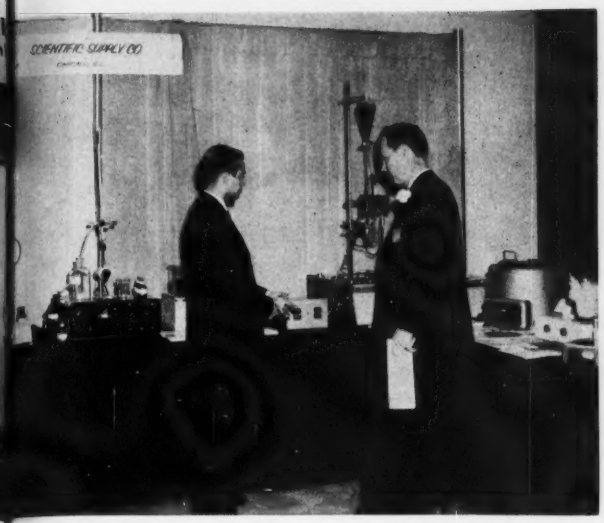
C. W. BRABENDER INSTRUMENTS, INC. • Left to right, F. Zucker, C. W. Brabender Instruments, Inc.; L. D. Sibbitt, North Dakota Agricultural Experiment Station; and Emily Wick, M.I.T.

STERWIN CHEMICALS, INC. • Left to right, C. G. Harrel, consultant; E. G. Bayfield, Florida State University; J. E. Riley, Quartermaster Food & Container Institute of the Armed Forces; Wm. J. Davis, Sterwin Chemicals, Inc.

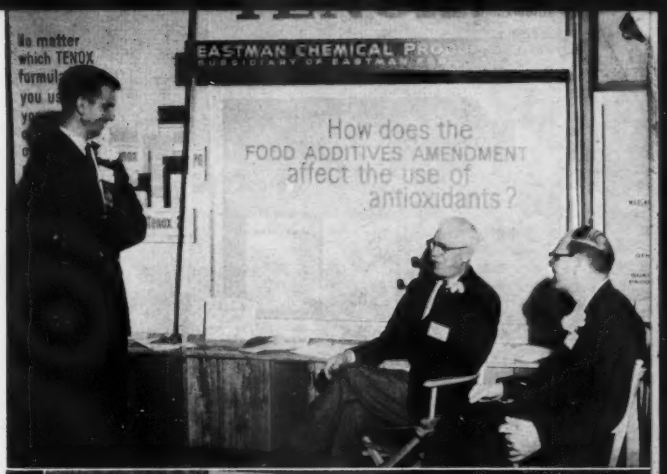
AMERICAN OPTICAL COMPANY • Left to right, James Larkin, Northern Utilization Research & Development Division; C. D. Neill, Enid Board of Trade Laboratory; R. K. Remmer, American Optical Company; V. G. Roberts, Kansas City Laboratory Supply Co.

COULTER INDUSTRIAL SALES • Left to right. John Moneymaker, The Paniplus Company; Robert Berg, Coulter Industrial Sales; Bruce Buddemeyer, The Paniplus Company; L. L. Warren, Commander-Larabee Milling Co.

NATIONAL MANUFACTURING COMPANY • Left to right. R. G. Pippitt and Joseph Sinner, both of the Pillsbury Company, discuss the merits of National's Reel-Type Oven with W. B. Bradley, American Institute of Baking.



SCIENTIFIC SUPPLY COMPANY • Left to right. Rudy Kileman, Scientific Supply Company, and Henry Zobel, Northern Utilization Research & Development Division.



EASTMAN CHEMICAL PRODUCTS, INC. • Left to right. E. R. Sherwin, Eastman Chemical Products; Robert B. Kilborn, The Wheatena Corp.; N. H. Kuhrt, Distillation Products Industries.

OHAUS SCALE CORPORATION • Left to right. Robert Preston, The Ohaus Scale Corp.; R. J. Dimler, Northern Utilization Research & Development Division; Anthony G. Bonagura, General Foods Research Center.

FRIES & FRIES, INC. • Left to right. Roderick West, Fries & Fries, Inc.; Eugene Ussery, Birdsey Flour & Feed Mills; Lewis Levy, The Griffith Laboratories; Clarence Seilkop, Fries & Fries; Merrill Gross, Fries & Fries.

MERCK AND COMPANY • Left to right. Wayne Carmichael, R. B. Pace, Paul A. Weeke, Merck and Company; S. F. Brockington, Quaker Oats Company; Clinton L. Brooke, Merck and Company.

CENTRAL SOYA COMPANY • Left to right. Dale W. Johnson, Central Soya Company (back to camera); Eugene Ussery, Birdseye Flour & Feed Mills; Sigmund Hoffman, Central Soya Company; B. B. Eichar, Central Soya Company.

Left to right. N. E. Lloyd, Clinton Corn Processing Co.; F. E. Kite, Corn Products Company; and James W. Evans, American Maize Products Co., discuss mutual problems in the corn wet milling industry.

CHAS. PFIZER & CO. • Left to right. R. C. Sherwood, Sterwin Chemicals; R. S. Shumard, Hercules Powder Co.; Enrico T. Palomba, Anheuser-Busch, Inc.; Charles Feldberg, Chas. Pfizer & Co.

PRECISION SCIENTIFIC • A group of interested chemists discuss laboratory equipment with company representatives.

HEGMAN, INC. • Left to right. Arthur van der Kloot, Wahl Henius Institute; Ray Michael, Hegman, Inc., and Ralph Hegman, same company, in a discussion of the Udy Protein Analyzer.

BRABENDER CORPORATION • Left to right. Arthur Hartkopf, Brabender Corporation; Dennis Daugherty, The Borden Foods Co.; and Ray Horn, Dixie Portland Flour Mills.

Left to right. Ralph Eide, Biscuit Bakers Institute; Henry Allen, Gerber Products; and Olga Golosinec, National Dairy Corporation, take time out to relax between sessions.

FINDINGS FROM RECENT STUDIES ON

Leavening Acids: Their Effect on the Shelf Life of Cake Mixes and on Cake Grain

By J. F. Conn and T. P. Kichline, Research Department, Inorganic Chemicals Division, Monsanto Chemical Co., St. Louis, Mo.

THE MAIN PROPERTIES of chemical leaveners relating to performance pertain to the total amount present, the rate at which gas is released and how much can occur per unit weight of leavener, and the possible rheological or structural effects the leavener exerts during processing or on the finished product.

There is relatively little published material on the effect of leavening on shelf-life of cake mixes. Baker (1) reported a loss of available carbon dioxide in devils-food cake mix stored at 90° to 100°F. with no humidity control. Bryant (3) found that 60% was the maximum relative humidity at which yellow and chocolate cake mixes could be stored without excessive soda loss. In gingerbread mixes containing molasses the maximum relative humidity was 32%. Matz and co-workers (4) related the CO_2 loss in mixes to moisture content of the flour. They concluded that mixes formulated with flour containing 7.4% or less moisture were quite resistant to deleterious aging reactions. Miller, McWilliams, and McMullen (5) also observed no loss of CO_2 from mixes compounded with flour at less than 6% moisture content. In these investigations, leavening deterioration would be associated with prereaction of the soda during storage. No data on the effect of leavening acids on storage life of mixes nor on the effect of storage conditions on rate of gas release have been noted.

The property of rate of gas release has generally been classified by the well-publicized Dough Rate of Reaction (DRR) method (2,6,7). The amount that can occur per unit weight is generally called the Neutralizing Value and is defined as the number of parts by weight of soda which can be neutralized by 100 parts of leavening acid (7). This property generally connotes price performance per unit weight of gas but can, of course, also exert a pH effect on the end product if varied. The possible rheological and structural effects of the leavener on the product have not been as well characterized as the earlier-mentioned properties, but various cation and anion groups are known to produce noticeable alterations. A fourth property, sometimes overlooked, pertains to the ability of the leavener to retain its original rate of reaction.

This paper shows the effects of leavener stability on specific volume of cakes after storage at controlled relative humidity and temperature. The studies cover single-leavener systems of anhydrous monocalcium phosphate (AMCP)[1] and sodium acid pyrophosphate (SAPP) and dual-leavener systems employing calcium and sodium phosphates.

The role of leavener effect on cake grain structure is shown for two dual systems. The first one is the commonly used anhydrous monocalcium phosphate (AMCP), plus a fast-reacting sodium acid pyrophosphate (SAPP-40). The second one consists of monocalcium phosphate monohydrate ($MCP \cdot H_2O$), plus a very slow-reacting sodium acid pyrophosphate (SAPP-RD).

Finally, the method for adjusting cake volume to a standard value is presented, so that the leavener effects on grain structure are on a comparable basis.

[1]AMCP is sold under the trade names of Py-Ran and V-90 and consists of coated particles with delayed leavening properties.

Materials and Methods

Cake mixes used in the tests were prepared in the laboratory, and the formulations used are given in Table I. In the one series of storage tests, 20-oz. portions of each mix were packed into standard cake mix boxes from which the protective glassine liners were removed. The packed boxes were placed in laboratory storage cabinets adjusted to duplicate average humidity and temperature conditions in Jacksonville, Florida. Temperatures and humidities were programmed to cycle from 90°F. and 50% r.h. to 75°F. and 75% r.h. in a 12-hour period. These conditions were used to accelerate storage deterioration and reduce the time required for the tests to 30 days.

In the "noncycled" storage tests, a portion of the 9.2% moisture flour was humidified to 14.3% moisture. In compounding the mixes, the original and humidified flour were blended to give 50% ($\pm 1\%$) relative humidity in the mix. The mixes were then stored in sealed glass jars at 90°F.

A Hobart N-50 mixer was used to prepare the batters in both the storage and grain studies. Routine, three-interval mixing was used in all tests. Batters were scaled into 8-in. round pans and baked at 375°F. for 25 minutes. The percent soda in the mix and the percent reserve soda in the batter were determined by Chittick gasometric analysis.

Combinations of $MCP \cdot H_2O$ and SAPP-RD were selected for cake grain comparisons to combinations

Table I. Cake Mix Formulations Used in the Storage Tests and in Determining the Effect of Leavening Acids on Cake Grain

Ingredients	*Cycled Storage*	*"Noncycled" Storage Tests*	*Effect of Acids on Grain*		
			White	*Yellow*	*Chocolate*
	parts	*parts*	*parts*	*parts*	*parts*
Layer cake flour (10% or less moisture)	40.00	37.88	34.6	33.8	29.3
Sugar (granulated, Baker's Special)	39.55	42.80	47.4	47.2	43.5
Shortening (medium emulsification)	13.00	13.00	13.2	14.2	14.2
Nonfat dry skimmilk	4.00	4.00	4.0	4.0	4.1
Dried egg albumen	1.25	....	...	...	...
Salt (fine)	0.80	0.80	.8	.8	.8
Vanillin	0.01	0.01	....	....	....
Sodium bicarbonate (fine)	0.63	0.70	... [b]	... [b]	... [b]
Dutched cocoa	....	....	...	...	8.1 [b]
Leavening acids [a]			[b]	[b]	
AMCP	0.76				
SAPP-28	0.88				
60% AMCP + 40% SAPP-28	0.80				
80% SAPP — RD + 20% MCP · H_2O	....	0.88			
70% SAPP-40 + 30% AMCP	....	0.85			
Ingredients used in batter preparation (for 500 g. mix)					
Egg white	....	70 g.	70 g.	...	...
Whole egg	....	....	....	120 g.	120 g.
Water	240 ml.	200 ml.	200 ml.	195 ml.	195 ml.

[a] Only one leavening acid or mixture was used for each mix.
[b] Individually weighed soda and leavening acids were added to the unleavened mix prior to mixing the batter.

of AMCP and SAPP-40. The amount of soda for each combination was calculated to give cake volumes equivalent to that obtained with 0.70% soda and the 70/30 SAPP-40–AMCP blend. The amounts of soda were also varied to provide 0.05% more and 0.05% less soda in the batter. The neutralizing values of the leavening acids and acid blends are presented in Table II. The individually weighed soda and acids were added to the unleavened mix prior to batter preparation.

Table II. Neutralizing Values of Leavening Acids

Leavening Acid	*Neutralizing Values for White and Yellow Cakes* [a]
100% SAPP-40	72.0
90% SAPP-40 + 10% AMCP	72.0
80% SAPP-40 + 20% AMCP	73.0
70% SAPP-40 + 30% AMCP	74.0
60% SAPP-40 + 40% AMCP	75.0
100% AMCP	83.5
100% SAPP-RD	72.0
90% SAPP-RD + 10% MCP · H_2O	72.0
80% SAPP-RD + 20% MCP · H_2O	72.0
70% SAPP-RD + 30% MCP · H_2O	72.0
60% SAPP-RD + 40% MCP · H_2O	72.0
100% MCP · H_2O	80.0

[a] For chocolate cakes the neutralizing values and amounts of soda were both increased 39%. The increases were made to darken the crumb color by increasing crumb pH.

Effects of Leavener Stability on Cake Volume

Figure 1 shows the effect on cake volume with mix storage time for two single leaveners and a mixture of these leaveners when cycled between 50% r.h. at 90°F. and 75% r.h. at 75°F. Although the conditions are more severe than most mixes would encounter over extended time periods, the accelerated conditions are relative and give insight into the cause of deterioration in mix leaveners. In this case, one would conclude that the AMCP by itself, or as part of a mixture, is the leavener that deteriorates.

In each of the figures the variability of the test is shown by the 2σ or 95% confidence limits. Thus, significance of the differences can be determined.

The 50% r.h. conditions noted in Figs. 2 and 3 are more representative of storage conditions. Here again, a decrease in cake specific volume occurs for the mixture of SAPP-40 and AMCP. In contrast, the mixture of SAPP-RD and MCP · H_2O has shown no decrease in volume. The relative difference in cake volume for the two leavener systems, after 90 days' storage of the mix, is illustrated in Fig. 3. This is as anticipated from the stability nature of the leaveners by themselves. The MCP · H_2O is not a delayed leavener and therefore does not increase its leavening rate on exposure to humidity. The SAPP-RD is the most stable grade of SAPP available. It shows no change in reactivity rate in a month at 65% r.h. and 90°F.

The differences in initial specific volume between the cycled and noncycled tests are attributed to the difference in mix composition (Table I). SAPP-RD had not been developed at the time the cycled comparisons were made. When compared in a mix similar to the noncycled mix but with only 0.64% soda, straight SAPP-RD gave 3.14 specific volume, vs. 3.09 for SAPP-28. Since it was more stable than SAPP-28, SAPP-RD was used with the MCP · H_2O and compared to the AMCP/SAPP-40 blend. Blends of AMCP and SAPP-40 are commonly used by mix formulators.

The curves of retained soda in the batter (Fig. 4) show the same general relationship as the cake volume curves. The less soda, the smaller the cake volume.

The mechanism of soda loss is apparently as follows. The data in Table III show that all the mixes studied lost up to 20% of the soda by prereaction in 90 days. This agrees with data reported by Bryant (3). The amount is close to that obtained when the nonleavening ingredients are reacted with soda, and indicates that pre-reaction in dry mix storage is es-

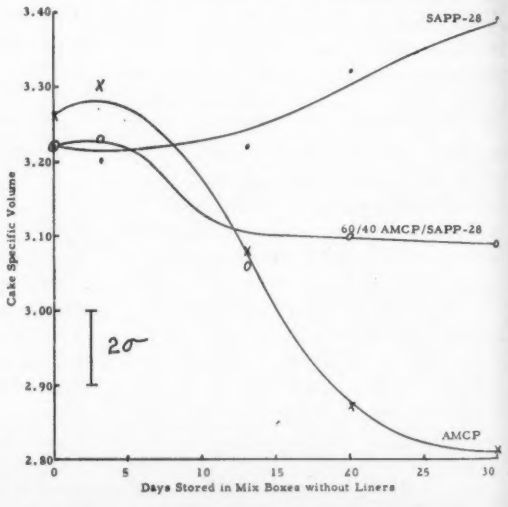


Fig. 1. Effect of storing white cake mixes at 90°F. and 50% r.h., cycled in 12-hour periods to 75°F. and 75% r.h.

Table III. Percent Soda in White Cake Mixes

Storage Time	Mixes Stored in Boxes without Liners at 90° F. and 50% r.h. Cycled to 75° F. and 75% r.h.			Mixes in Glass Jars at 90°F. and 50% r.h.	
Days	AMCP	SAPP-28	60% AMCP + 40% SAPP-28	70% SAPP-40 + 30% AMCP	80% SAPP-RD + 20% MCP · H_2O
0	0.63	0.63	0.63	0.70	0.70
2½	0.57	0.57	0.56	...	...
13	0.58	0.58	0.58	...	...
20	0.53	0.54	0.53	...	...
23	...	...	...	0.62	0.62
30	0.54	0.55	0.55	...	...
94	...	...	...	0.55	0.56

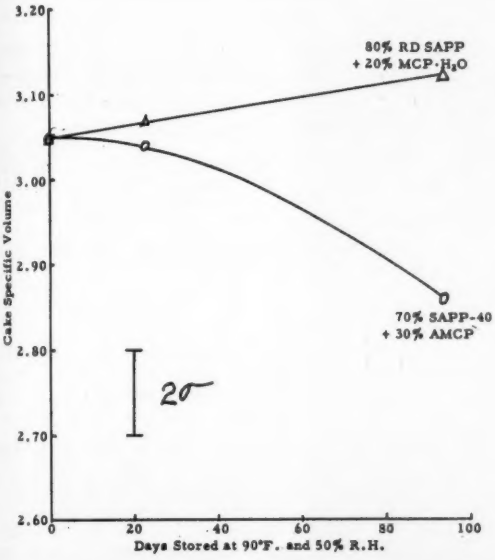


Fig. 2. Improved storage stability of white cake mix.

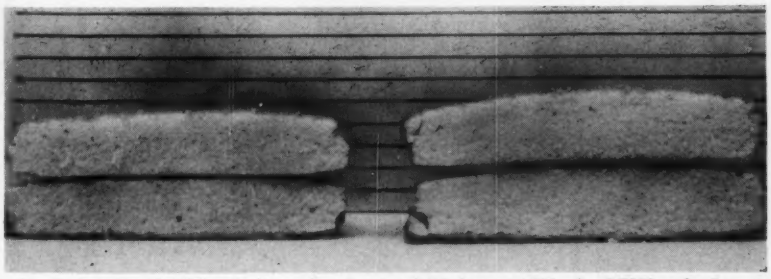


Fig. 3. Superior shelf-life of white cake mix, stored 94 days at 50% r.h.; 0.70% soda. Leavening: left, 30% AMCP, 70% SAPP-40; right, 20% MCP·H_2O, 80% RD-SAPP.

sentially between soda and such non-leavening ingredients as flour and milk. This is also shown by essentially no decrease in batter soda during storage of the SAPP-28 mix. The remaining amount of the soda losses occurring in the batters is attributed to loss in leavener delay properties. These results agree with those of separate self-rising flour storage tests[2].

Effect of Leavening on Cake Grain

Calcium ions as part of a leavening system impart a finer grain structure to baked goods. To obtain this characteristic, a compromise with shelf-life stability can be made by using combinations of AMCP and SAPP. An alternate method for desired grain structure without sacrifice of stability should result from a combination of MCP · H_2O and SAPP.

White, yellow, and chocolate layer cakes were baked to make cake-grain comparisons between MCP · H_2O/SAPP-RD blends and AMCP/SAPP-40 blends. The 1:4 sugar:flour ratio is higher than that used in cake mixes; it was picked to correspond to that which a commercial baker might use.

The effect of MCP · H_2O on grain was similar to the effect of AMCP. In all three types of cake, grain of the 80/20 SAPP-RD–MCP·H_2O blend was rated equal to the control blend (70/30 SAPP-40/AMCP). Figures 5, 6, and 7 picture sections of the cakes with the pertinent data listed opposite each section. Only one section per leavening acid combination is shown. The sections were taken from the cakes of most nearly equal volume.

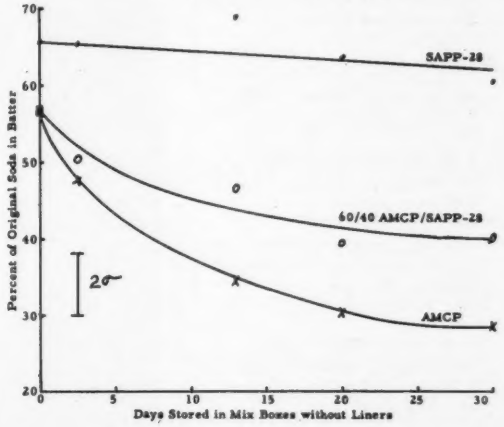


Fig. 4. Amount of soda in batters prepared from white cake mixes stored at 90°F. and 50% r.h., cycled in 12-hour periods to 75°F. and 75% r.h.

Standard Cake Volume for Comparing Leavener Effect on Grain

Since lightness or volume affects cake grain, equivalent volumes were needed to compare the effect of acids on grain.

Langguth[3] showed that cake volumes decreased as the 2-minute DRR values of various leavening acids increased. By subtracting each of the 2-minute DRR values from 100, the differences would be proportional to cake volume and the amount of soda in the batter. Thus, an equation may be written for the amount of soda needed with new leavening acids to produce volumes equivalent to a standard system.

$$X = \frac{K_a\,(100 - V_a) + K_b\,(100 - V_b)}{K_m\,(100 - V_m) + K_n\,(100 - V_n)}\,Y,$$

where:

X equals percent soda to use in the new leavening system;

[2] Conn, J. F., and Langguth, R. P. Data to be published.

[3] Langguth, R. P. Paper presented at 43rd annual meeting, Cincinnati, Ohio, April 1958.

Y is percent soda used in the standard leavening system;

K_a is proportion of acid A used in the standard leavening system;

K_b is proportion of acid B used in the standard system;

K_m is proportion of acid M used in the new leavening system;

K_n is proportion of acid N used in the new system;

V_a and V_b are 2-minute DRR values of acids A and B; and

V_m and V_n are 2-minute DRR values of acids L and M.

The method for calculating the soda required to give volumes equal to the control was reasonably accurate. The volumes are noted in Figs. 5, 6, and 7. Volumes essentially equal to the control were obtained with all the acid blends, straight SAPP–RD SAPP-40, and AMCP. Volumes attained with straight MCP · H_2O were smaller than the control and appeared to level off. The reaction rate of straight MCP · H_2O is so fast that CO_2 is probably lost after the batter is placed in the oven and before it starts to "set." Increased amounts of soda increased the cake volume and specific volume. The data are not reported, since the objective was to compare grain at the same volumes.

Summary

These data were taken from various projects, each of which was directed toward a specific application. Therefore, variations occur in the test conditions used to demonstrate different points. Similar results, however, have been obtained in this lab-

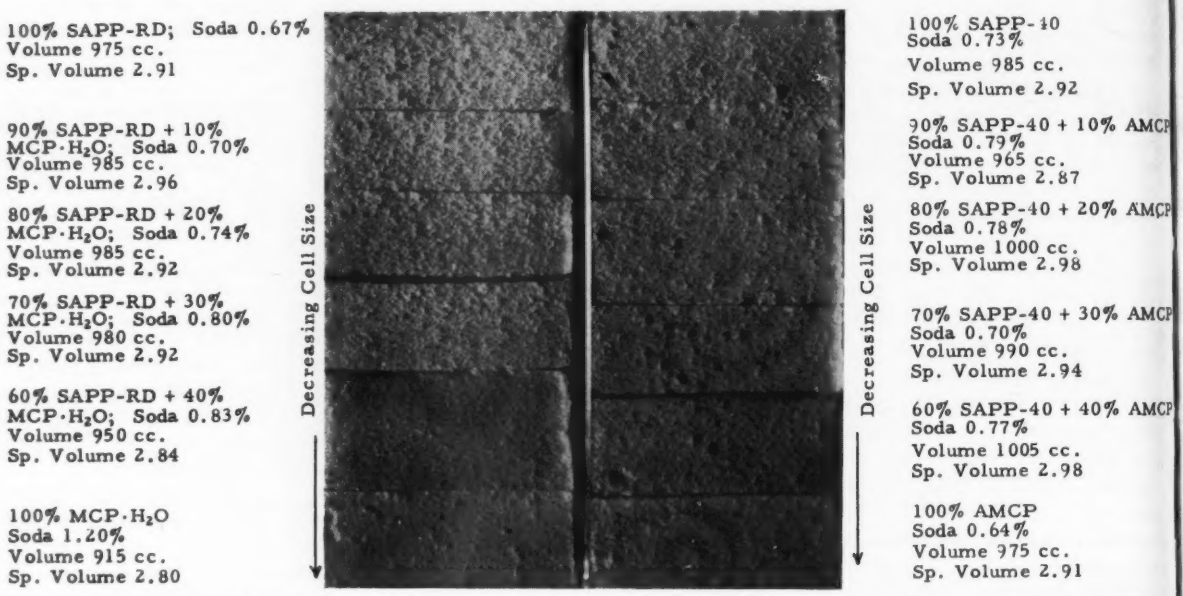
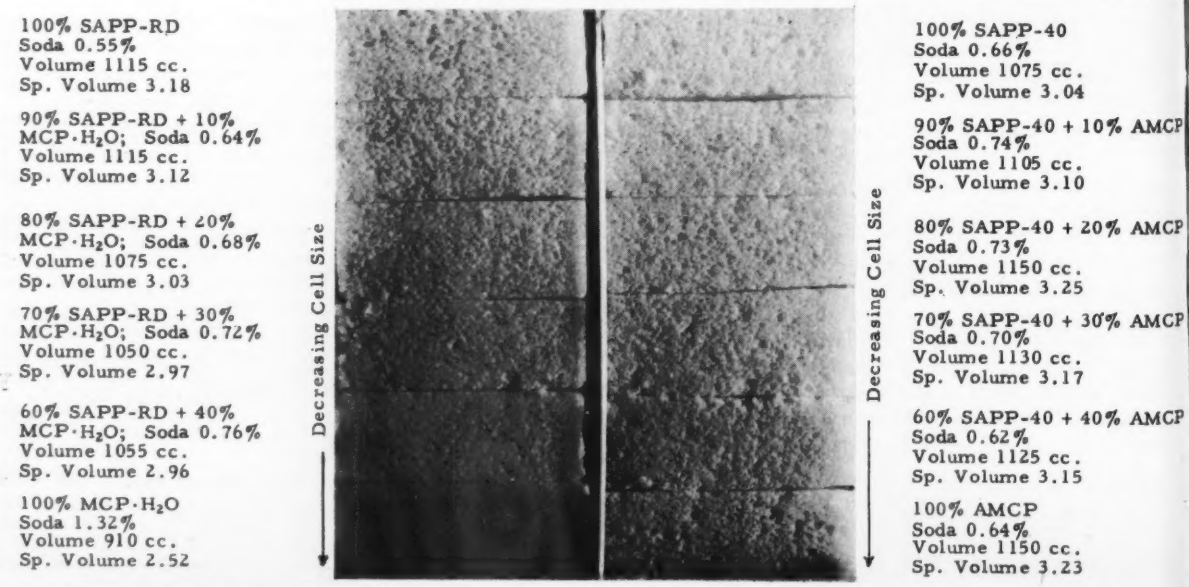


Fig. 5. Effect of leavening acids on grain of white layer cakes. (Amounts of sodium bicarbonate were adjusted to give comparable volumes.)

Fig. 6. Effect of leavening acids on grain of yellow layer cakes. (Amounts of sodium bicarbonate were adjusted to give comparable volumes.)



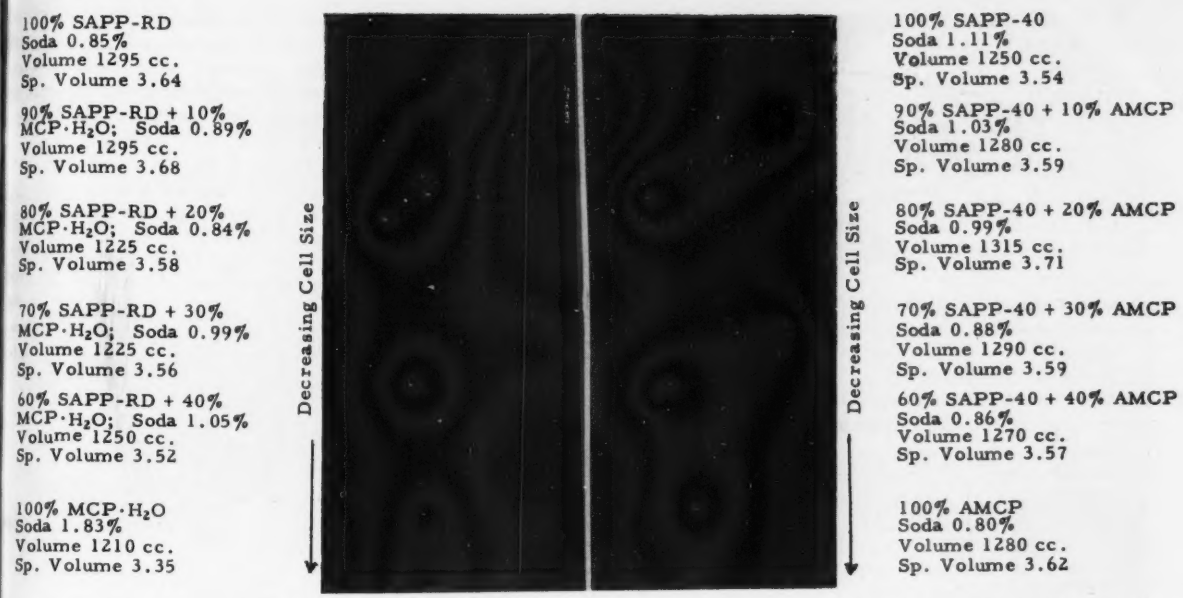


Fig. 7. Effect of leavening acids on grain of chocolate cakes. (Amounts of sodium bicarbonate were adjusted to give comparable volumes.)

oratory with other types of mix. Therefore the following conclusions appear valid and warrant investigation by those interested:

1. Cake mixes leavened with MCP · H_2O/SAPP-RD blends had longer shelf-life than mixes leavened with AMCP/SAPP-40 blends.

2. The major decrease in cake volume during storage of AMCP-leavened mixes was due to deterioration of the delayed leavening characteristics of the AMCP.

3. Most of the soda prereaction in the mix was with acids of the flour and ingredients other than leavening acids.

4. MCP·H_2O has an effect on grain similar to that of AMCP.

5. Cake volumes may be adjusted by using the leavening acid DRR values to calculate the amount of soda to use.

Acknowledgment

The assistance of A. R. Handleman and J. L. Vetter in conducting this work is appreciated by the authors.

Literature Cited

1. Baker, Charles E., Jr. Prepared flours. *Am. Miller & Processor 16:* 78–82, 217 (Jan. 1948).
2. Barackman, R. A. *Cereal Chem. 8:* 423 (1931).
3. Bryant, R. S. Hygroscopic equilibria studies on prepared cake flours and the relationship between moisture content and stability of the chemical leavening agents. *Thesis,* University of Minnesota (1949).
4. Matz, S. A., McWilliams, C. S., Larsen, R. A., Mitchell, J. H., Jr., McMullen, J. J., and Layman, B. *Food Technol. 9:* 276 (1955).
5. Miller, J. A., McWilliams, C. S., and McMullen, J. J. *Cereal Chem. 36:* 156 (1959).
6. Parks, J. R., Handleman, A. R., Barnett, J. C., and Wright, F. H. Methods for measuring reactivity of chemical leavening systems. I. Dough rate of reaction. *Cereal Chem.* (in press).
7. Van Wazer, J. R., and Arvan, P. G. *Northwestern Miller 251:* Part I — No. 6, Sec. 2: 3A–6A, 20A (Feb. 9, 1954); Part II — No. 10, Sec. 2: 3A–5A, 15A (March 9, 1954).

People, (Products), Patter

• • • **People**

Claude F. Davis died April 27, 1960. A member of the AACC since 1926, he served as president of the organization in 1940-1941.

Lawrence S. Hopper named assistant products control manager for General Mills' Sperry (Western) Operations; will also supervise the test bakery and analytical laboratory work at the Sperry administrative offices in San Francisco.

Frank Kenney appointed liaison officer of American Society of Brewing Chemists to the Malting Barley Improvement Association; he is associated with P. Ballantine and Sons, Newark.

Leonard Kresoy now manager of products control for General Mills' feed division, located at general office in Minneapolis; formerly in charge of laboratory at Chicago plant.

Mary Brooke Mahan died April 28, 1960, in Kansas City, Missouri. She was a member of the AACC since 1922 and was its first woman president, 1934-1935.

Walter Mark joins Western Condensing Co., Division of Foremost Dairies, as technical service representative to bakeries; will work nationally in a sales service capacity.

Daniel McPherson joins basic milling staff of General Mills Central Research Laboratories, Minneapolis; will serve as leader of the Flour Quality Section; from the company's Sperry Division at San Francisco. He has been with GM since 1949.

H. E. Olson elected president of Carnation Co.'s newly reorganized Albers Milling Co.; succeeds **Fred W. Hoover, Jr.,** who has resigned. **G. A. Ensminger,** Albers vp-feed marketing, elected executive vp of Albers and head of its Milling Division. **Henry C. Arnest** will head sales and merchandising, Cereals and Pet Foods divisions. **George Forney,** Albers vp, in charge of grain procurement for all three divisions. **Francis Albers** continues as Albers vp-production for all divisions.

Perie Pitts retired March 1, after 26 years with Evans Milling Co., Indianapolis.

Millo Prochazka now with laboratory staff of The Pillsbury Co., Buffalo; from Maritime Milling Co., Buffalo.

Wendell Reeder, a member of the AACC's Board of Directors, died in Dallas, Texas, on April 9, after a long illness.

Dr. Reeder has been with the Campbell-Taggart Co. since 1941; was vice-president and president of its Research Corporation; director of research for its Associated Bakeries, and director of the company's fellowship at Mellon Institute of Technology.

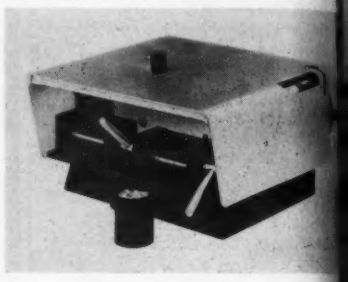
Dr. Reeder has had many papers published in scientific journals and has been awarded patents in the field of chemistry. He was a leader in promoting and testing new and imported wheat varieties, and was recognized as a national figure in the field of cereal chemistry and the baking sciences.

He was a member of Sigma Xi and American Chemical Society. For the AACC, preceding his directorship, he served on various committees and subcommittees and was chairman of Lone Star Section in 1955.

Dr. Reeder is survived by his wife, Lorna S., two sons, and two daughters, all of Dallas; also by his mother, four sisters,

• • • **Products**

Air Comparison Pycnometer. new principle for rapid, nonde structive measurement of volum density, and porosity on irregula powdered, and porous solids is i corporated in this instrument. It designed for laboratory and fie use, to save time on measuremen formerly done with displaced li uids or involving direct pressu determination. Areas of applic



tion include moisture content density measurement of grain cereals, and dried food product quality control of fats, mixture etc.; grading of pressure-expande cereals and other foods. For detai write to George H. More, sale manager, Houston Instrumen Corp., PO Box 22234, Houston 2 Texas.

• • •

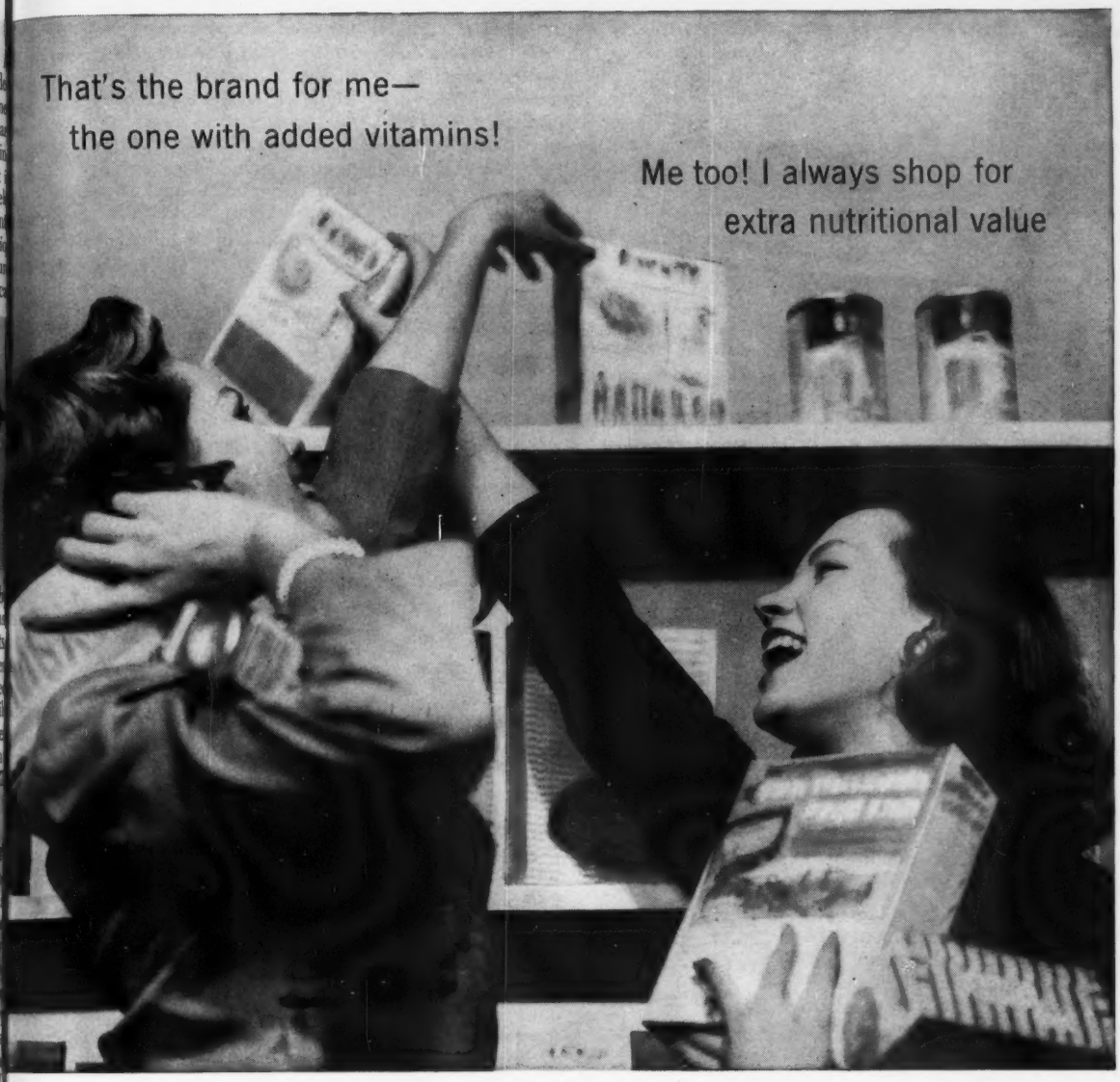
Combination All-Purpose Shee er-Molder. Manufactured by M line, Inc., Duluth, Minn., this is high-speed, multi-purpose machi for retail and specialty bakers, ha ing features previously found on on large, expensive sheeting a molding equipment. It molds ma kinds and shapes of bread by cros grain, reverse sheeting, or conve tional style. Two models are avai able, with one-powered or two powered infeed conveyor. For de tailed information, specifications photographs, etc., write to Moline Inc., PO Box 308, Duluth, Minn.

• • •

Laboratory Recorder. The Sar gent Sr Recorder is designed t fill the need of a low-cost recorde suitable for such specific duties as use with gas chromatogram insta lations, incorporation in titratio assemblies, continuous single-var able recording from an installe transducer, or specialized electro lytic operations in analytical lab oratories. For copy of Bulleti SR-A write: E. H. Sargent & Co. Dept. SR-A, 4647 W. Foster Ave Chicago 30, Ill.

• • •

Automatic Fraction Collecto Exclusive features claimed fo this apparatus are automatic ro



Nutrition-Conscious Customers Buy Fortified Products

You gain an edge over competition, create excitement *and* sales by fortifying with Merck Vitamins and Amino Acids. Almost any processed food is a candidate for fortification, and you can choose from nearly a dozen Merck Nutrients—all easily adaptable to normal food processing operations.

You'll find unlimited possibilities for developing new products by adding extra nutrients—not just those for which the Government has set Minimum Daily Requirements (Vitamins A, D, B_1, B_2, Niacin), but other essential nutrients like Vitamin B_{12}, Lysine, and Vitamin B_6—each loaded with consumer glamour.

Merck can supply you with all these nutrients—and top-notch technical service to boot. Just call in your Merck representative or write directly to Rahway for the details.

MERCK CHEMICAL DIVISION
MERCK & CO., INC. • RAHWAY, NEW JERSEY

©Merck & Co., Inc.

positioning of gear-shift type to prevent missed tubes or rows; electronic control; new photoelectric volume collector, producing an exact volume each cycle. (Series 1000 Collector, manufactured by the Chromatography Corp. of America.) Midwest distributor is Scientific Supply Co., 1743 W. Rosehill Dr., Chicago 26, Ill.

• • •

Automatic Spectro-Titrator. The Stone Spectro-Titrator (E. Leitz, Inc., New York City) automatically performs titrations that depend upon a color change to indicate the endpoint or equivalence point. The instrument automatically stops the flow of titrant when an indicator in the sample solution changes color. Midwest distributor: Scientific Supply Co., 1743 W. Rosehill Dr., Chicago 26, Ill.

• • • **Patter**

Pillsbury transfer. To improve existing facilities for flour milling and to offer greater service to bakers and industrial users of flour in northern California, The Pillsbury Co. has transferred its feed manufacturing operations at the Sacramento mill to its Reedley and Modesto operations. Leo Bilger is manager; Richard Bradford continues as Sacramento plant manager.

• • •

New quarters. The Chicago office of Givaudan-Delawanne, Inc., and its associate companies, Givaudan Flavors, Inc., and Sindar Corporation, moved to new quarters on April 1, at 6778 Northwest Highway, Chicago 31.

• • •

Conventions in Canada. The Canadian Institute of Food Technology will hold its third annual conference on June 9 and 10 at Royal Alexandra Hotel, Winnipeg. Its theme will be "Food quality." Details of the program and registration form are available from Mr. A. G. McLeod, Manitoba Dept. of Health, 320 Sherbrook St., Winnipeg 2, Manitoba.

The Canadian Dietetic Association meets on June 14, 15, and 16, at Queen Elizabeth Hotel, Montreal. Chairman of the publicity committee is Claire Dalme, Inst. of Dietetics and Nutrition, Univ. of Montreal, PO Box 6128, Montreal, P. Q.

• • •

Summer course in food science. The Royal College of Science and Technology, Glasgow, Scotland, will be host for a residential summer course on recent advances in food science, Sept. 5 to 19. Admission will be restricted to 70 places, some of which will be reserved for students from overseas. A grant from the North Atlantic Treaty Organization will be used to pay residence and tuition fees of suitably qualified overseas students. Among participants in the planning and instruction on individual topics are the British Baking Industries Research Association and the Research Association of British Flour-Millers.

Courses in Commodities (Part I) include the microbiology of foods; meat, milk and eggs; fish; cereals; fruit and vegetables. Under Processing (Part II) will be dehydration; dairy products; canning; refrigeration and quick-freezing; milling and baking; sugar, salt, and acid preserves.

Scientific outings will be arranged for the Wednesday afternoons, and social outings on the Saturdays. Trout fishing, mountaineering, and golf are planned for weekends; also sightseeing tours of the Central Highlands or to Ayrshire and the Burns Country.

Closing date for applications is June 13. For forms write to The Department of Food Science, Royal College of Science and Technolgoy, George Street, Glasgow, C.1.

• • •

Flavoring in instant puddings. **The Givaudan Flavorist** (No. 1, 1960) discusses instant puddings, "The Magic Mix," first as to their composition (gelling salts, type of thickener, sweetening, etc.), but particularly as to the selection and application of flavor in the puddings. The chemical composition of the instant pudding and its texture, says the article, create a special problem for the flavorist because the flavor has to mask the chalkiness and starchiness which are inherent to this type of pudding. In many instances a flavor which will do an excellent job in a cooked pudding cannot be used with identical results in an instant mix. A review of the economic aspect of flavoring the mix discusses natural flavors and their synthetic counterparts.

• • •

Library classification schemes sought. The Committee on Special Classifications of the Special Libraries Association and the Classification Committee of the Cataloging and Classification Section, Resources and Technical Services Division, American Library Association, are cooperating in a continuing project to develop and expand a Loan Collection of library classification schemes originally established by the Special Libraries Association. This Collection covers all fields of science, law, medicine, technology, the social sciences and the humanities.

New libraries or libraries with special collections are constantly asking for classifications – in all areas of knowledge – and it is imperative that the Collection be kept up-to-date through the addition of new schemes or with modernized versions of existing classification schedules. Curators of special collections, special librarians, and those individuals who have developed special classification schemes for specific types of material or for special subjects are invited to contribute a copy of their work to the Collection. Classification schemes should be sent to Dr. Jesse H. Shera, Curator, SLA Loan Collection, School of Library Science, Western Reserve University, Cleveland 6, Ohio.

CLASSIFIED

WANTED: MANAGER, CONTROL LABORATORY. Graduate Chemist to head up control laboratory and run specialized tests. Send resume giving age, education, experience, recent snapshot, and salary requirements.

Challenging position for capable man. Prefer cereal chemist background, 10 years experience. Contact: Illinois Cereals Mills, Inc., Paris, Ill.

WANTED TO BUY OR RENT: A used Extensograph. Reply to: Dept. 33, CEREAL SCIENCE TODAY, 1955 University Avenue, St. Paul 4, Minnesota.

FOR SALE: DESPATCH BAKE OVEN; style 138, 115 volt, 500° Fahrenheit maximum temperature, automatic control; inside dimension 35″ x 20″ x 12″ high. $175 f.o.b. Denver. Also MacMICHAEL VISCOMETER, Fischer; complete, excellent condition; extra cup and plunger for small quantity samples. $250 f.o.b. Denver. Contact: M. A. Rust, Industrial Laboratories Co., 1720 Clay Street, Denver 4, Colo.

table setting by
Georg Jensen Inc., New York

Basic Good Taste!

For best quality flavor designed especially for your *packaged cereals* and *dry mixes*

Sealva Flavors

Polvaromas

The original hermetically sealed dry powdered flavors designed to withstand shelf-life and bake-out and still deliver fresh full quality flavor at the table.
The IFF laboratories will design a flavor for your exclusive use — tell us your needs.

iff

VAN AMERINGEN-HAEBLER • POLAK & SCHWARZ

INTERNATIONAL FLAVORS & FRAGRANCES INC.

417 Rosehill Place, Elizabeth 2, N. J.

Leading Creators and Manufacturers in the World of Flavor

ARGENTINA AUSTRIA BELGIUM BRAZIL CANADA ENGLAND FRANCE GERMANY HOLLAND INDONESIA ITALY NORWAY SOUTH AFRICA SWEDEN SWITZERLAND

AACC LOCAL SECTIONS

Nebraska Section members met in Lincoln on March 26 and visited the new Wheat Quality Laboratory at the College of Agriculture. Paul Mattern, who is in charge, explained that the laboratory is financed in part by the Nebraska Wheat Commission to help plant breeders in their work.

Edwin Moniot of the Baker Process Co. showed a film, "Continuous Do-Maker Process," and talked about what can be done with the process and about requirements for its successful operation.

D. B. Pratt, Jr., AACC National President, reported on the progress of the convention in Chicago. He also spoke on "Air classification of flours" and showed slides of various baked goods made from fractions of different flours.

New officers: Rex Rucksdashel, chairman; Edgar Meyers, chairman-elect; Gil Aron, secretary-treasurer.

• • • •

Kansas City Section met April 27 at Hotel President. Following an informal dinner, Sam D. Fine talked on "Problems arising from the use of agricultural chemicals." Mr. Fine is district director, U. S. Food & Drug Administration, Kansas City, Mo. Annual election of officers followed the program.

• • • •

Niagara Frontier Section's speaker for its March meeting (14th) was C. M. Hollenbeck of Wisconsin Malting Co., Manitowoc. Subject, "Reaction of malt during baking." Barley malt was discussed, and facts were given which the audience felt were much needed and very informative.

New member: Frank Szematoucz, Co-op G.L.F., Buffalo.

William Kazanjan, International Breweries, Buffalo, has undergone surgery at Mary Fletcher Hospital, Burlington, Vt.

At the April meeting (11th), J. A. Maselli of Fleischmann Laboratories, Stamford, Conn., spoke to the group. The 33 members attending also toured O'Rourke Baking Co. (Interstate Bakeries), Buffalo, on invitation of Ben Riederer, production superintendent of the bakeries.

New members: J. C. Nowreu, Cornell University; Calvin Smith, G.L.F. Mills, Buffalo; Donald Wallings, Eastern States Farmers' Exchange, Buffalo; Richard Nowakowski, G.L.F. Mills Div., Churchville, N. Y.; Joseph Molchan, Will Corp., Buffalo.

• • • •

New York Section held a "Ladies' Night" meeting for members and their wives, presenting as speaker Virginia M. White, field staff nutritionist of the American Institute of Baking. Her topic, "You, too, can eat and grow slim," stressed that "calorie-wise" bread has a definite and important function in each diet.

At the last regular meeting of the season (April 12), Hugh Cole, technical director, Firmenich, Inc., addressed the group on the subject of "Powdered flavors." By definition, these are the spray-dried product of an emulsion of gum arabic and a liquid flavor. At the present time, Mr. Cole said, only artificial flavors are being processed in this way. He explained that because the gum arabic vehicle clings tenaciously to the flavor molecules, these flavors have longer shelf-life than liquids have; hence their primary use is in dry mixes. Mr. Cole answered questions after his talk.

New officers elected at this meeting are: William J. Simcox, chairman; Ronald A. Morck, vice-chairman; John T. Buckheit, secretary-treasurer.

• • • •

Pioneer Section met in Wichita on April 1 and 2 at Hotel Lassen, some 40 members attending. A business meeting was followed by election of the following officers: Eugene Holm, chairman; Bob Hoecker, vice-chairman; and Bert Morgenson, secretary-treasurer.

Speakers and their subjects were: John Sullivan of Kansas State University – "Starch, a complex polymer"; Frank Hoecker, chairman of radiation biophysics, University of Kansas – "Rule of radiation in the food industry"; and R. S. Bryant – "Use of phosphates in the food industry."

Coveted trophies for excellence of analytical work on the Pioneer Check Sample for the past year were awarded to Robert Pruckler and Harry Stapleton, tied for ash; Loren Francis for protein; Robert Pruckler for moisture; and Marvin Armour for maltose. The presentations were made by D. H. Ginn, shown at left in the photo; the others are, from left, Pruckler, Armour, Francis, and Stapleton.

• • • •

Midwest Section members enjoyed a tour of the Columbia Malting Company's malt manufacturing facilities on April 4. This company manufactures a line of high-grade barley malts useful in food items to impart flavor or to supply starch-liquefying or saccharifying enzymatic activity. The tour included all steps of malt manufacture, including steeping, germinating, kilning, and roasting. The new modern vertical malting plant and new caramel malt roasting plant were inspected. After the tour, members gathered at the Phil Smidt Restaurant for refreshment and sustenance.

New officers elected at the March 7 meeting: Tod Stewart, chairman; Stanley Watson, vice-chairman and program chairman; Roy Bradshaw, secretary-treasurer.

Visitors at the March meeting were overseas guest Helmut Korp of A. B. Karlshamms Oljifabriker, Karlshamm, Sweden; also Clint Brooke and other friends who were attending the meeting of the American Society of Bakery Engineers.

• • • •

Canadian Prairie Section members met on March 15 in the Grain Exchange Board Room, Winnipeg, and

MELT POINT *Kaola-Style*

How Durkee Research Took the Oily After-taste Out of Frozen Desserts

THE PROBLEM: *complex*. Consumers didn't like a lot of things about frozen desserts. Especially oily after-taste and waxy film left in the mouth. The cause was the high melting point of vegetable fats which were being used to provide stand-up characteristics. Frozen dessert manufacturers needed a fat base designed specifically for their use—and Durkee's Technical Research Staff set out to give them one.

THE SOLUTION: *painstaking*. New fat bases were developed. Frozen desserts were made... tested... tasted... and even produced in Durkee's pilot plant which simulates actual plant conditions. The result was Kaola, a patented all-vegetable fat base with a melting point below body temperature. Today, taste panels invariably prefer frozen desserts made with Kaola over those made with competitive products.

THE SIGNIFICANCE: *rational*. Kaola, the unique frozen dessert fat, is another example of Durkee know-how and research facilities helping food producers market better products more economically. We'd welcome an opportunity to provide comparable assistance to you whenever your product or process warrants further attention. Just drop a line to

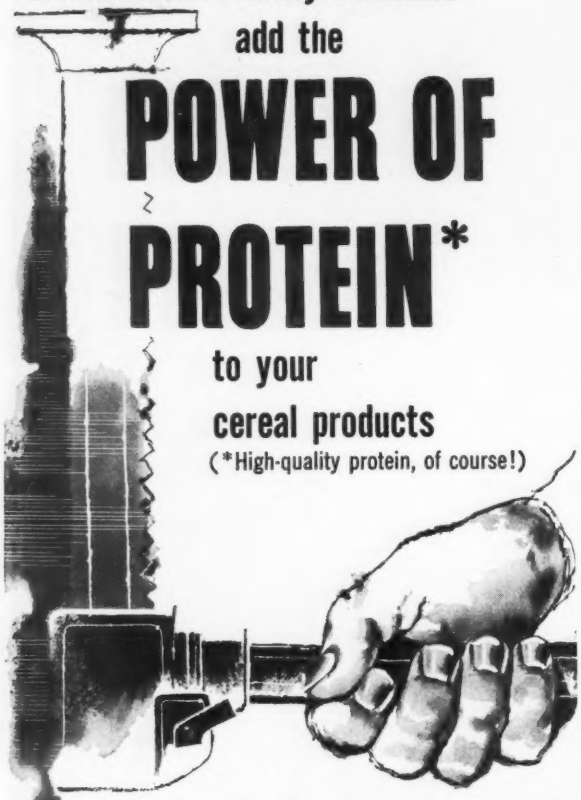
DURKEE TECHNICAL SERVICE

Department CST • 900 Union Commerce Building • Cleveland 14, Ohio
Jamaica, N.Y. • Louisville, Ky. • Berkeley, Calif. • Chicago, Ill.

QUALITY Glidden PRODUCTS

TO JACK UP SALES in today's market add the POWER OF PROTEIN* to your cereal products

(*High-quality protein, of course!)



Today's smart food buyer insists on not just more protein — but more *high-quality* protein in the cereal she buys.

That's why increasing numbers of cereal manufacturers are turning to Sheftenes! . . . Because Sheftenes are a complete *milk* protein with an essential amino-acid "profile" (especially rich in lysine and tryptophane) that's ideal for upgrading the nutritional value of cereals.

Sheftenes are tasteless, odorless, colorless, fat-free too — and handle readily on your present equipment. And they're exceptionally versatile! With Sheftenes you can achieve the taste and texture characteristics you set out to get . . . and do it economically in the bargain.

If you're looking to "beef up" sales of a new or established brand, add the power of Sheftene high-quality proteins now. For free samples, data or technical assistance write Dept. C-50.

SHEFFIELD CHEMICAL
Norwich, N. Y.

A DIVISION OF NATIONAL DAIRY PRODUCTS CORPORATION

Western U.S. distribution through
BRAUN-KNECHT-HEIMANN CO.
and Affiliates — San Francisco

were greeted by D. B. Pratt, Jr., on one of his official visits to local sections as AACC national president.

The April meeting (19th) was held at Fort Garry Brewery, in the Hospitality Room. After refreshments and buffet dinner, special entertainment was presented: J. A. Anderson and his production of "Around the world in sixty slides" – a picturesque travelogue of Dr. Anderson's visits to various countries of the world.

New members: Miss K. Wach, Barley Research Institute; and M. Hartmann, Ogilvie Flour Mills Ltd.; both of Winnipeg.

• • • •

Northern California Section members enjoyed a seafood dinner on March 23 at Spenger's Fish Grotto in Berkeley, as a preliminary to Joseph Bottini's talk on "Food additives," a topic of vital interest to all in the food and allied fields. Mr. Bottini is with the Bureau of Food and Drug Inspections of the California Department of Public Health.

With the departure of vice-chairman Dan McPherson to Minneapolis, secretary Bill Stephens moves up to fill his vacant post and treasurer Del Loewe becomes secretary. Each will continue with his former duties, however, until June, when they become chairman and vice-chairman respectively.

• • • •

Northern and Southern California Sections' joint meeting in Fresno on April 8 and 9 was hailed as the best ever. Friday's program began at 2 p.m. with a tour of the Ranchers Cotton Oil plant. Cocktail hour, banquet, and dancing were enjoyed in the Western Room, Town and Country Lodge.

Saturday morning's technical session presented these speakers and subjects: D. B. Pratt, Jr., "Management looks at quality control"; C. E. McDonald, "Wheat gliadin as a food product"; Leonard E. Thompson, "Udy protein analyzer – discussion and demonstration"; Maura Bean, "Evaluation of performance of eggyolk in cake doughnuts"; and Max Lauritzen, "Bulk sugar handling."

The afternoon session presented D. L. Lindgren – "Use of gas chromatography in stored-products insect fumigation"; and H. A. Sokol – "Relationship between sulfhydryl group content of flour and mixing behavior."

All arrangements were ably handled by Dan McPherson. Social program chairmen were Bob Burns and Cecil Pinney, and the technical program was arranged by Bob Moffit and Walter Broom.

• • • •

Chesapeake Section met March 24 at Log Lodge, Beltsville. Following an excellent dinner, "Recent developments in feeds and foods" were discussed by Ralph F. Kneeland, chief of Food Branch, Bureau of Enforcement, FDA. First calling attention to the great progress we have made since the early 1900's in quality and healthfulness of our foods, Mr. Kneeland discussed specifically our knowledge and current studies concerning chemicals which may be carcinogenic. Guarding the health of the American public, he said, is a never-ending problem, because each new elixir imparts its own hazards.

Dinner on April 29th at Kenney's Restaurant, Philadelphia, preceded an excellent talk on "Memory training" by John Wagner, assistant director of bakery operations, American Stores Co. Mr. Wagner has had broad experience in the social training field; his suggestions about what we can do to improve our ability and capacity to remember can very well be put to practical use. For the most part, Mr. Wagner empha-

sized, good memories are developed, and this requires guidance and training.

H. D. Brown, American Stores Bakery, is a new section member.

• • • •

Cincinnati Section held a Spring Meeting on April 23 at Schuller's Wigwam, Cincinnati, with an afternoon program followed by dinner.

"Essential oils of Africa," a color film, was shown by Walter Eller of Fritzsche Bros., Inc., Cincinnati office. Black pepper, geranium, and clove were featured among oil-bearing plants of Africa which are harvested for flavorings and perfumes. Crop-gathering is done largely by hand, and oil recovery methods are time-consuming.

"Thermogravimetric analysis of starch-sugar-water mixtures" was presented by William Yamazaki of the Soft Wheat Quality Laboratory, Wooster. An analytical balance hooked up with a furnace heated at 174°C. was used to measure rate of water loss and total water loss of aqueous systems. Silica-water and starch-water mixtures showed a linear relationship in rate of water loss; sugar-water mixtures gave a retarded curve.

A session on "Laboratory gadgets" was held, L. J. Brenneis presiding. Devices discussed were: An automatic alcohol dispenser for quick-ash; sample mixer; agitator; scanning device for materials inspection; rolling pin ridged on each end; plastic Petri dishes for S&S ruled filter paper; O-ring insertion for desiccator cover; and heating pad for controlling mixing bowl temperature.

Following 6 p.m. dinner, Donald W. Johnson, supervisory chemist of the FDA, Cincinnati office, spoke on "Food additives and other problems." He explained the meaning of the Miller Amendment of 1954 and the Food Additives Law of 1958. Pesticide residues on farm products are not considered food additives as such, he said. A food additive is any substance that is added during the time the food product is being processed.

New officers: Harry Loving, chairman; L. J. Brenneis, vice-chairman; D. K. Dubois, secretary-treasurer.

The next meeting will be held October 7 and 8 at the Severin Hotel, Indianapolis, jointly with the Ohio Valley District, AOM.

R. C. Brink, The Kroger Company, Cincinnati, is a new member.

INVENTORY CLOSEOUT

AACC Monograph Series: Vol. I

"Enzymes and Their Role in Wheat Technology"

by J. A. Andreson

$5.00
(List $7.50)

Order from

AMERICAN ASSOCIATION OF CEREAL CHEMISTS
1955 University Ave. • St. Paul 4, Minnesota

PUT YOUR PRODUCT IN ORBIT

with a FRIES & FRIES "SPACE AGE FLAVOR!"

Many new food products blast-off with a satisfactory roar, only to disappear later into the ocean of unsuccessful ventures. In spite of the millions in research, development, packaging, advertising and market testing behind them, only a relative few have all the essentials, plus that extra "thrust of power", of an individually developed **flavor** that's built right into the basic formula.
FRIES & FRIES "Space Age Flavors" are engineered for the current era . . . the era of convenience foods. They're made for your product by people who know the flavor business with a thoroughness that comes from generations of experience. Launching a new product is expensive and difficult.
Let a FRIES & FRIES Space Age Flavor give it that thrust necessary to put it into a long, swinging, profitable orbit!

MANUFACTURING CHEMISTS
FRIES & FRIES
INC
CINCINNATI
U.S.A.

CINCINNATI . . . 110 E. 70th Street
NEW YORK . . . 418 E. 91st Street

the President's Corner

news of the association

MINUTES OF THE ANNUAL BUSINESS MEETING

Hotel Morrison
Chicago, Illinois
May 5, 1960

President Pratt opened the meeting at 1:35 p.m. Secretary Pence then moved for acceptance of the minutes of the previous Annual Business Meeting as printed in the May 1959 issue of CEREAL SCIENCE TODAY. The motion was seconded and carried. Blanket approval and acceptance was then given reports of the Board of Directors, Treasurer, Editors, and the several technical and non-technical committees as printed in the April 1960 issue of CEREAL SCIENCE TODAY. Dr. Geddes offered the motion and Dr. Ramstad seconded.

Dr. Leland Underkofler won the prize drawing for those who had visited all of the exhibit booths. The prize was an automatic electric coffee percolator.

Mr. Kenton Harris, Chairman of the Technical Policy Committee, reviewed informally and very briefly the accomplishments of the technical committees. The open committee meetings enjoyed quite good attendance, and much progress was reported. Firm recommendations regarding standard curves and certifications of bowls through contract arrangements with an independent testing laboratory were a feature of the Physical Testing Methods Committee. Possible combination of Sanitation Check Service samples with certain of the Sanitation Review Service samples was discussed in some detail at the Technical Policy Committee open meeting.

Dr. Sherwood described very briefly the need for and the nature of the proposed revisions of the By-Laws that had been circulated to the membership in accordance with necessary procedures. The proposed changes were ratified unanimously.

Highlights of the Board of Directors meeting discussed informally by President Pratt included outline of place for the forthcoming 46th Annual Meeting in Dallas. Revision proposals for Cereal Laboratory Methods are well along, as are chapter drafts for Monograph No. III. A new class of membership is being considered to accommodate retired members who retain an active interest in the Association. Dr. J. A. Anderson was appointed an official delegate of the AACC to represent the Association during his forthcoming travels to many countries in the Pacific-Asia areas, where he will visit private, government and educational institutions.

Reports of the Program and Local Arrangements Committees for the 45th Annual meeting consisted of referrals to the content and course of events of the preceding days. Particular appreciation was voiced by Program Chairman Koch for the participation of the authors of the papers presented. President Pratt appointed Rowland Clark and Clint Cregier to act as Audit Committee for the 45th Annual meeting.

Following the report of the Resolutions Committee, a motion for adjournment was entertained by the Chair and the meeting closed at 2:05 p.m.

Respectfully submitted,
James W. Pence, Secretary

• • • England

The following abstract has been forwarded by the British Baking Industries Research Association, from a full report on fungal amylases in flour, prepared by the Association. (Recently published in: *J. Sci. Food Agr. 11*(1): 54; 1960.)

" 'Diastatic activity' is an important property of flour and can be considered to be dependent on two main factors: a) the susceptibility of the starch in the flour to attack by amylolytic enzymes which may be naturally present in the flour or added, and b) the amylase content of the flour.

"Amylases, the enzymes which catalyze the hydrolysis of starch, are generally classified into two main types, alpha- and beta-amylase. The saccharogenic or sugar-producing enzyme, beta-amylase, is usually present in sufficient quantities in flour. Alpha-amylase, the starch-liquefying and dextrinogenic enzyme, is, however, present in very small amounts in flour milled from sound wheat but increases with the degree of sprout. Flours deficient in diastatic activity may be supplemented by the miller or by the baker and the traditional diastatic supplement is malt flour.

"In recent years, amylases derived from fungal sources have been increasingly used to improve the diastatic performance of flour. Such products are prepared in the form of highly active powders which may be diluted by the manufacturers to produce materials of uniform strength which have certain advantages. Purified fungal amylases have been accepted in the U.S.A. as ingredients of bread and rolls.

"Fungal amylases are being increasingly used as flour additives. As the methods normally used in the examination of flour do not reveal the presence of these materials, a technique has been developed which may be employed for their detection and semiquantitative estimation.

"The decrease in alpha-amylase activity which occurs when a flour extract containing calcium ions is heated at 68°C. for 30 minutes may be employed for the detection and estimation of fungal amylases in flour. Confirmation of the presence of fungal amylase and of the amount which has been added to flour can be obtained by using the relationship between cereal alpha-amylase activity and Hagberg number."

GAS TREATMENT OF FOODSTUFFS

A second edition of their Bulletin No. 1, entitled "Fumigation with Methyl Bromide under Gas-proof Sheets," has just been issued by the Pest Infestation Research Laboratory of the Department of Scientific and Industrial Research, London, and may be obtained (price 4s. 11d., including postage) from H. M. Stationery Office, P.O. Box 569, London, S.E.1., or from British Information Services, 45 Rockefeller Plaza, New York, 20. It is stated in the prefatory note that in the four years since first publication the method, for fumigation of stacks of commodities, described in the bulletin, has been increasingly practiced in many parts of the world. The degree of care and thought given initially to the various practical details of the process is evident from the bulletin, which contains some 40-odd pages and 16 excellent illustrations (plates). Literature references are given in connection with American practice, on similar lines, with bagged rice and also with the fumigation (not treated in this bulletin) of whole buildings under sheets — as practiced, particularly, in California, against the Khapra beetle.

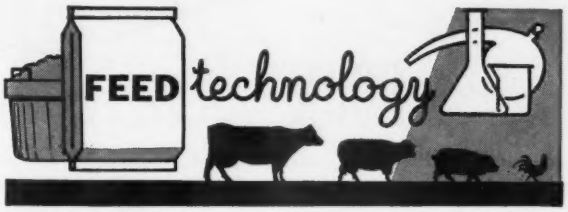
The bulletin discusses in detail such practical questions as: a) stack shapes, suitable types of sheeting and methods for laying and joining it; b) suitable types of piping and connecting fittings, and arrangements of these designed to promote, as far as possible, uniformity of treatment having regard to the pressure fall that must occur along any pipe carrying active nozzles; c) fumigant supply. Methyl bromide is available, with or without 2% added chloroficrin, in cylinders of six — 140-lb. (for fumigation) and 1,800-lb. (for shipment).

In Great Britain 17 p.p.m. is generally accepted as the maximum safe limit for content of methyl bromide in an atmosphere likely to be breathed by personnel not equipped with respirators. Concentrations greater than this can be detected by means of a flame test (using a halide detector lamp). The dose used against insects in large stacks of bagged grain is 1 lb. per 1,000 cu. ft. for a 24-hour period. At higher temperatures, the dosage can be reduced, since methyl bromide is much more toxic to insects at, for example, 30°C. than at 15°. However, there are large differences in tolerance between different insect species and also between the different stages of a given species (incidentally, the eggs are *not* the most resistant stage).

Furthermore, some commodities, particularly maize (corn), show relatively high absorptive capacity for the fumigant, and the dosage applied must be increased considerably to allow for this and also for the unevenness of distribution attending handling of large stacks (such as are customary with maize). This leads to consideration of a difficulty associated with the process as applied to wheat, which is that an excessive application of the fumigant may cause a slight taint to be produced in the flour and loaves as a result of the breakdown of the products of reaction between methyl bromide and certain sulfur-containing protein groups. While it is stated that this should never arise in a properly arranged treatment, the difficulty may arise in practice, in the absence of actual determinations of gas concentration at different points in the stack, as to how far a particular treatment may be regarded as "properly arranged." Several factors that can affect the uniformity of distribution of gas and also the minimum dosage required for effective fumigation are mentioned in the bulletin. It is also stated (in the prefatory note) that the amount of effective additional information resulting from the widespread practice of the method, during the four years since the first edition, has been limited because measurements of gas concentrations, etc., have not been generally undertaken.

The caution is given that reduction of germinative power may follow treatment of seeds with methyl bromide; the risk of this is reduced if the moisture content is below 13%.

C. R. JONES



FEED MILL SAFETY

Of importance to every feed manufacturer are three new standard codes for prevention of dust explosions, as revised by the National Fire Protection Association. These are:

"American Standard Code for Prevention of Dust Explosions in Flour and Feed Mills, Z 12.3–1959," 50 cents.

"American Standard Code for Prevention of Dust Explosions in Terminal Grain Elevators, Z 12.4–1959," 50 cents.

"American Standard Code for Prevention of Dust Ignitions in Country Grain Elevators, Z 12.13–1959," 40 cents.

Copies are available from National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

ROBERT C. WORNICK

Table of Contents from Vol. 37.... No. 3, May.

Effect of the Relative Quantity of Flour Fractions on Cake Quality. D. H. Donelson and J. T. Wilson, Ohio Agricultural Experiment Station, Wooster.

Studies on the Behavior of Active Dry Yeast in Breadmaking. J. G. Ponte, Jr., Continental Baking Co., Rye, N.Y.; R. L. Glass and W. F. Geddes, University of Minnesota, St. Paul.

Studies with Radioactive Tracers. V. The Reduction of S^{35}-Labeled Persulfate to Sulfate in Flour and Dough Systems. C. C. Lee and D. G. Small, University of Saskatchewan, Saskatoon.

Five Proposed Methods for Determining Smut Content in Wheat. Robert M. Johnson, Agricultural Marketing Service, USDA, Beltsville, Md.

On the Absorption of Liquid Water by the Wheat Kernel. H. A. Becker, Cambridge, Mass.

Chromatographic Method for Fractionating Globulins of Corn. T. A. McGuire, Northern Regional Research Laboratory, Peoria, Ill.; E. M. Craine, The Upjohn Co., Kalamazoo, Mich.; and R. J. Dimler, NRRL, Peoria.

BOOK reviews

Some Aspects of Food Technology in India. Editors: H. A. B. Parpia, R. C. Bhutiani, K. L. Radhakrishnan, A. N. Sankaran, and B. V. Subbarayappa. Published by Central Food Technological Research Institute, Mysore, India, 1959; 160 pp. Reviewed by C. H. BAILEY, University of Minnesota, St. Paul, Minn.

The twenty-six sections of this volume are based upon reports rendered at the FAO-UN Regional Seminar on Food Technology for Asia and the Far East, held on August 1–8, 1959, in Mysore, India. The prefatory note by V. Subrahmanyan, who is also one of the principal contributors to the technical text which follows, emphasizes local prejudices against processed foods, and the stimulus to local processing that occurred during World War II and subsequent developments which resulted from the periodic or local scarcity of standard foods. It appeared that governmental agencies had to take the lead in facilitating new developments in this area. This publication is essentially a compilation of contributions to the seminar by members of the Central Food Technological Research Institute.

In the opening paragraph of the first section the authors state that shortage of food has become a serious problem in India, which may reach alarming proportions unless action can be taken for controlling it. The procedure to be followed is complicated by the presence in that country of 14 different cultures, their mores, and the low level (15%) of literacy. An outline of some of the areas of study and development and the role of the governmental food technology institute follows. These areas cover such general aspects as substitute and supplementary foods, preservation, infant foods, and the facilities of publication, extension services and otherwise which may be utilized in informing the public concerning nutrition and food preparation.

Section 2, on rice substitutes, deals with a phase of cereal technology that has been receiving considerable attention in the Orient, notably in India and Japan, in recent years. Tapioca macaroni production is also described in the same section. Rice technology in India, covered in the third section, gives particular attention to the evolution of parboiling methods as a means of improving both nutritive value and eating qualities of rice so treated. Little attention is given to cereal enrichment or, in fact, to other cereal foods than rice.

Considerable space is devoted to discussion of the characteristic Indian foods, such as preserves or murabbas (Sec. 10), chutneys (Sec. 11), pickles (Sec. 12), arvi or colocasia for chapatis (Sec. 21), as well as to spices and aromatics (Secs. 22 and 23).

■ ■ ■ ■

What Consumers Should Know About Food Additives. Food and Drug Administration, Dept. of Health, Education, and Welfare, 1959. Available at 15 cents per copy from the Superintendent of Documents, Washington 25, D.C.

An explanation in nonscientific terms of why additives are used in food processing and how the new amendment to the Food, Drug, and Cosmetic Act will protect the public.

Wet-Milling High-Amylose Corn Containing 49- and 57-Percent-Amylose Starch. R. A. Anderson, C. Vojnovich, and E. L. Griffin, Jr., Northern Regional Research Laboratory, Peoria, Ill.

The Bromate Reaction in Dough. II. Inhibition and Activation Studies. W. Bushuk and I. Hlynka, Grain Research Laboratory, Winnipeg, Manitoba.

The Effect of Remixing on the Structural Relaxation of Unleavened Dough. A. H. Bloksma, Institute for Cereals, Flour and Bread T.N.O., Wageningen, The Netherlands; and I. Hlynka, Grain Research Laboratory, Winnipeg, Manitoba.

Effect of Malting Procedure and Wheat Storage Conditions on Alpha-Amylase and Protease Activities. James R. Fleming, John A. Johnson, and Byron S. Miller, Kansas State University, Manhattan.

Effect of Environment, Variety, and Class of Wheat on Alpha-Amylase and Protease Activities of Malted Wheat. James R. Fleming, John A. Johnson, and Byron S. Miller, Kansas State University, Manhattan.

Damaged Starch. Quantitative Determination in Flour. R. M. Sandstedt and P. J. Mattern, University of Nebraska, Lincoln.

Weight and Volume Changes in Wheat during Sorption and Desorption of Moisture. W. Bushuk and I. Hlynka, Grain Research Laboratory, Winnipeg, Manitoba.

Improved Tempering and Modified Milling Techniques for Small Samples of Wheat. L. D. Sibbitt, D. H. Classon, and R. H. Harris, North Dakota Agricultural Experiment Station, Fargo, N. D.

Grain Storage Studies. XXX. Chitin Content of Wheat as an Index of Mold Contamination and Wheat Deterioration. Moishe Golubchuk, University of Minnesota, St. Paul; L. S. Cuendet, Cossonay-Gare, Switzerland; and W. F. Geddes, University of Minnesota, St. Paul.

A Note on an Improved Denaturation Test for Gluten Based on Solubility in Acetic Acid. W. C. Schaefer, C. A. Wilham, R. W. Jones, R. J. Dimler, and F. R. Senti, Northern Regional Research Laboratories, Peoria, Ill.

NEW AACC MEMBERS

ACCOLA, A. J., JR., *Marketing Product Manager*, Merck and Co., Inc., Rahway, New Jersey.

ARON, C. GILBERT, *Supervisor*, Wheat Protein Lab., Lincoln Grain Exchange Laboratory, 505 Garfield, Lincoln, Nebr.

BONHAM, EDWARD K., *Head of Sanitation Work*, 1200 So. Red Bank Road, Evansville 12, Ind. (Mead Johnson & Co.).

BUCK, PAUL A., Division of Food Science, Cornell University, Ithaca, New York.

COHEN, SOL, *Supervisory Chemist*, U.S. Food & Drug Administration, Washington & 3rd Avenue So., Minneapolis, Minn.

COLLINS, JOHN J., JR., *General Plant Manager*, Megowen Educator Food Co., Lowell, Mass.

CORBISHLEY, JOHN V., *Supervisor Quality Control*, Hercules Powder Co., Harbor Beach, Mich.

CRANE, ANATOLE, The Quaker Oats Company, 617 Main St., Barrington, Ill.

DONOHUE, RAY B., JR., *Chemist and Food Technologist*, 827 South Elm St., Sherman, Texas. (Anderson, Clayton & Co.).

ELLING, HOMER R., *Experimental Miller*, Wilson 8, Washington State University, Pullman, Wash.

FUKUDA, RICHARD T., 1425 West 42nd St., Chicago, Ill. (Armour & Co.).

GABBY, J. L., 5512 Madison Avenue, Evansville, Ind. (Mead Johnson & Co.).

HALVERSON, JOHN C., *Chief Chemist*, Commander-Larabee Milling Co., 1701 Armour Road, No. Kansas City, Mo.

HARNESS, JOHN, *Ass't Director, Technical Sales Service Dept.*, The Hubinger Co., Keokuk, Iowa.

HASLIP, NORRIS R., *Ass't Products Control Manager*, General Mills, Mill Lab., 701 So. 1st St., Minneapolis, Minn.

HEPBURN, FRANK N., *Research Chemist*, The American Institute of Baking, 400 E. Ontario St., Chicago 11, Ill.

HONNIGFORD, JOSEPH B., Mead Johnson & Co., Evansville 21, Ind.

HOPKIN, JAY J., *Cereal Chemist*, DCA Food Industries, Inc., Ellicott City, Md.

HOWARD, N. B., *Technical Staff Ass't*, 1155 Southern Hills Blvd., Hamilton, Ohio. (The Procter & Gamble Co.).

HUFFMAN, GEORGE W., *Research Chemist*, Quaker Oats Research Labs, 617 West Main St., Barrington, Ill.

HULLETT, ERNEST W., *Director in Charge*, P. O. Box 1489, Christchurch, N. Z. (Wheat Research Inst.).

JOHNSON, DALE W., Central Soya Company, 1825 No. Laramie Ave., Chicago 39, Ill.

KNECHT, ROBERT M., *Director, Quality Control Lab.*, P. O. Box 533, Elgin, Ill. (Borden Special Products Co.).

LINKO, PEKKA, Milling Dept., Kansas State University, Manhattan, Kans.

LLOYD, NORMAN E., *Supervisor*, Starch Chemistry Research, Clinton Corn Processing Co., Clinton, Iowa.

LUSAS, EDMUND, *Project Leader*, The Quaker Oats Co., Research Labs, 617 West Main St., Barrington, Ill.

MADDEN, M. G., Barley Research Institute, 206 Grain Exchange Bldg., Winnipeg, Manitoba, Canada.

MAREK, PAUL J., Nebraska Consolidated Mills Co., 1521 No. 16th St., Omaha 10, Nebr.

MERCK AND COMPANY, LTD., Attn.: Wm. E. Parry, 560 de Courcelle St., Montreal, P.Q., Canada.

MOYER, JOHN H., 294 Harvard Road, Garden City South, L. I., New York. (DCA Food Industries).

NIELSEN, ARTHUR J., *Technical Sales*, 1812 West Highland, Appleton, Wis. (Western Condensing Co.).

NELSON, GORDON V., 2467 Stony Point Road, Petulma, Calif. (Foremost Dairies).

PARMAN, GEORGE K., *Technical Director*, Vitamin Division, Hoffman-LaRoche, Inc., Nutley, N. J.

PETERSON, CARL G., *Products Control Manager*, General Mills, Inc., 701 So. 1st St., Minneapolis, Minn.

PONTE, JOSEPH G., JR., *Research Chemist*, 58 Blachley Road, Stamford, Conn. (Continental Baking).

RAGGIO, MIGUEL, *Director of Research*, Gaspar Campos 841, Vicente Lopez, FNGMitre, Argentina.

REYNOLDS, WILLIAM B., *Vice President in Charge of Research*, General Mills, Inc., 9200 Wayzata Blvd., Minneapolis, Minn.

RILEY, JOHN E., 2503 Elm St., Parkersburg, W. Va. (Quartermaster Food & Container Inst.).

SAMPSON, ROY L., *Quality Control Manager*, 210 So. Garey St., Los Angeles 12, Calif. (Pillsbury Co.).

SCOTT, MAURICE W., *Quality Control Supervisor*, 2040 Williams St., San Leandro, Calif. (Kellogg Co.).

SHAND, ALLAN D., *Analytical Chemist*, D. H. Brown & Son, P. O. Box 242, Christchurch, N. Z.

SMITH, CLIFFORD E., Research Laboratory, A. E. Staley Mfg. Co., Decatur, Ill.

SMITH, M. DOREEN, *Head, Dept. of Food Chemistry*, University of Toronto, Toronto 5, Ont., Canada.

STREIGHTIF, CLIFFORD B., *Chief Chemist*, 228 E. 142nd Place, Dolton, Ill. (United Chemical & Organic Prod. Co.).

STUSSI, WILLIAM E., *Head, Analytical Lab.*, American Bakeries Co., 919 No. Michigan Ave., Chicago 11, Ill.

TATE, GEORGE E., *Products Control Manager*, General Mills, Inc., Box 180, Wichita Falls, Texas.

TUTHILL, C. N., *Production Manager*, International Standard Brands, 625 Madison Ave., New York 22, N. Y.

UNITED SALT CORPORATION, Attn.: L. F. Van Stone, 4614 Montrose Blvd., Houston 6, Texas.

VAN METER, WILLIAM R., *Consultant*, W. R. Van Meter & Co., 14 Cumberland Road, West Hartford 7, Conn.

VOGT, VINCENT T., *Head, Cereal Labs*, Kroger Food Foundation, 1212 State Avenue, Cincinnati, Ohio.

WACH, KAY, Barley Research Institute, 206 Grain Exchange Bldg., Winnipeg, Manitoba, Canada.

WEAVER, WILLIAM D., *Chief Chemist*, Quality Control, Mt. Vernon Milling Co., Mt. Vernon, Ind.

WILHOIT, R. O., *Owner and Manager*, A. D. Wilhoit Laboratories, 619 Flour Exchange, Minneapolis 15, Minn.

WILLIAMS, CHAS. R., *Division Sales Manager*, 4848 5th St., Long Island City, New York (Anheuser-Busch, Inc.).

WORTHEN, LEONARD P., *Quality Control Manager*, 343 King St., Midland, Ontario, Canada. (Pillsbury of Canada, Ltd.).

Observations

Well, the annual convention is over. We hope everyone who attended enjoyed the meeting as we did. Several chemists mentioned Ivanhoe, which shows they also spent some time reading high school literature. I was surprised to hear some of our French chemists mention Chez Paree and La Petite Gourmet; perhaps these expressions have special meaning. "Kungsholm" and "A Little Bit of Sweden" are of course very familiar to all of us Scandinavians. Is there any who did find out not only "who is Jim Doty" but also why?

It is time to prepare for the new wheat crop. The experimental mill needs the annual overhauling and oiling and greasing. It will be interesting in our laboratory to see how new crop flours behave in the bake test using our new laboratory continuous mixer. We hope to do some special experimental milling of new flours varying the roll settings so that various granulations will be baked by this new continuous method.

We at Doty Laboratories, Inc. stand ready to serve you in any way we can. If you have special problems that need study, present your problem to us and give us an opportunity to quote you a price for the study.

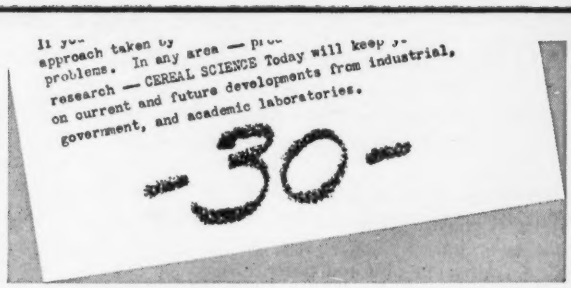
So now you know, who is

Jim Doty

DOTY
Laboratories

1435 Clay St.,
North Kansas City 16, Mo.

MILLING **FEED ANALYSIS**
VITAMIN ASSAYS
BAKING **SANITATION**


research — CEREAL SCIENCE Today will keep
on current and future developments from industrial,
government, and academic laboratories.
-30-

THANK YOU — CHICAGO

First of all a sincere *thank you* to the Midwest Section for the excellent job turned in at our 45th Annual Meeting. Ed Feigon, Bob Koch, and their committees conducted a very smooth running operation which made the meeting that much more enjoyable for those attending. Few of us realize the amount of work necessary to put on a convention. When everything goes as planned we tend to forget that the local group behind the scenes is making it all possible.

I would like to remind AACC members that advance registration (without advance payment) will be in operation again next year at Dallas. Bill Bradley, who handled registration at Chicgao, tells me that the system worked well and reduced the time of registration drastically. With a little more cooperation from those attending we can make the registration procedure at Dallas almost painless (except for signing the check!).

SHOULD THE AACC GROW?

This seems like a strange question, but it is one that does make sense if you give it some thought. It will come as no surprise if I say that most people like to be associated with a successful venture. We rather take this attitude for granted. Success for an organization means different things to different people, but basically it means that an organization is doing a necessary job for its members and doing it well. As a result of this "well performed service" the organization is apt to attract more members.

More members mean more income. More income means more and better services to members for a lower *unit* cost. So far, so good. But what about the human equation?

I have heard from long time members that the AACC used to be "one big happy family" back in the good old days, and it hasn't been the same since it grew so large. This is hard to dispute. No convention of 800 people (and we're averaging close to that each year) can possibly act like or enjoy the same social informality that's possible for a group of 200. The informality and family atmosphere that made the AACC conventions so popular in the '30's cannot exist today on the same scale. We still are informal, we still have a family atmosphere, we still know a lot of other members at the meeting, but we can't pretend things are the same today as 20 to 25 years ago.

We must realize that the AACC's growth has been gradual and reflects the vast expansion that has taken place in the cereal industry over the past 30 years. Our goal should not be one of merely acquiring numbers, but of *attracting every active, qualified cereal chemist in the industry.* If there are 500 cereal chemists in the field then we should have 500 members in the AACC. If there are 5000 cereal chemists then we should have 5000 members. If the AACC is to represent the cereal chemist and attempt to solve some of his technical problems, then it must have a substantial membership among those working in the cereal industry. The results from a recent survey taken by the AACC indicate that close to 400 individuals in the U.S. and Canada have the qualifications for membership but have not yet applied. We want and need these 400 cereal chemists. We want and need their help and experience so that as a group we might perform a valuable service to the industry for which we work.

Lyle Carmony, chairman of the AACC's Membership Recruitment Committee will be out beating the bushes this year. Give Lyle and his committee your help by signing up one new member in 1960.

R.J.T.